AN ECONOMIC AND INSTITUTIONAL APPROACH TO THE USE OF NATURAL COMMON-POOL RESOURCES BY THE TOURISM INDUSTRY

DOCTORAL THESIS

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To my family,
for their support and love.

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IX

An economic and institutional approach to the use of natural common-pool resources by the tourism industry.

Resumen

El análisis de la gestión de recursos naturales se ha basado tradicionalmente en el supuesto de que los agentes son *free-riders*. Bajo este supuesto no hay cabida para las iniciativas ambientales voluntarias y la intervención pública se considera imprescindible para evitar la sobreexplotación de los recursos. Este planteamiento choca con un cuerpo de literatura sobre gestión de recursos naturales que muestra la acción ambiental voluntaria como una posibilidad teórica y una realidad empírica. Esta tesis analiza los incentivos de las empresas turísticas que usan recursos de libre acceso a desarrollar iniciativas ambientales voluntarias y como estos incentivos se ven afectados por cambios institucionales. El marco conceptual se fundamenta en el *Institutional Analysis and Development Framework* (IAD), que orienta el desarrollo analítico de una familia de modelos de teoría de juegos estrechamente ligados. En primer lugar se desarrolla un modelo base en el que las empresas usan un recurso natural de libre acceso y pueden mitigar sus impactos mediante decisiones unilaterales voluntarias. Las iniciativas voluntarias son costosas, pero dadas las condiciones de mercado permiten a las empresas cargar primas de precio. Sobre este modelo de partida planteamos cambios institucionales en forma de introducción de normas de comportamiento no vinculantes, implantación de un estándar ambiental mediante regulación, existencia de corrupción, empresas no reguladas y la creación de una etiqueta verde de voluntaria adhesión. Consideramos también el efecto sobre los incentivos de comportamiento derivados de la potencial heterogeneidad de las empresas así como de la dinámica del recurso natural.

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Chapter 1: Introduction

Regulations to control environmental impacts have been widely criticized for being costly and inefficient (Arimura, Hibiki, & Katayama, 2008; Dawson & Segerson, 2008). These concerns, jointly with a growing belief in the need to provide firms with the flexibility to choose the least costly methods of pollution control, have instigated the search for alternatives to command-and-control regulation.

One alternative is to move to using taxes and tradable permits, which rely on price signals and thus provide the necessary flexibility (Alberini & Segerson, 2002). The task of efficiently designing such instruments for the large number of existing environmental impacts, however, would be administratively difficult, slow, and costly (Khanna, 2001). Since modern environmental problems are complex, there are operative difficulties in embracing market-based policies as a single and sole solution (Stoeckl, 2004). Further, these instruments are politically fraught and difficult to implement due to opposition from business sectors and industry associations (Arimura et al., 2008).

Another alternative that has received increasing attention is reliance on voluntary environmental protection (Dawson et al., 2008; Glachant, 2007; Khanna, 2001; Lyon & Maxwell, 2002; Sasidharan, Sirakaya, & Kerstetter, 2002). This alternative is supported by the desire to find cost-effective solutions to environmental problems and adopt a cooperative approach between industry and governments. This approach is also purported to help prevent the negative legal and political consequences associated with regulatory failure (Arimura et al., 2008; Khanna, 2001). The institutional analysis literature demonstrates that, in addition to command-and-control and market incentives, there is a wide range of alternative institutional designs for the governance of natural assets (Ostrom, 1990a). Corporate social responsibility has become one of the most striking environmental developments over the 1990s (Arimura et al., 2008; Lyon et al., 2002). Such responsibility has gained prominence among business leaders, academics, investors, and governments (Andrews, 1998; Khanna, 2001).

Scholarship on common pool resources (CPRs) has shown that resource users often create institutional arrangements and management regimes that help them allocate benefits equitably, over long periods, and with only limited efficiency losses (Agrawal, 2001). Empirical research consistently shows that when users of CPRs organize themselves to devise and enforce their own rules, they tend to manage resources more sustainably than when rules are externally imposed on them (Ostrom, 2000).

This evidence contradicts mainstream economic theory. Since Hardin and his tragedy of the commons (Hardin, 1968), a whole body of literature has emerged to deal with the free-rider problem for open access natural resources (Hardin, 1998). This literature argues that users of natural resources would have no incentive to engage in responsible management, since the predicted non-cooperative behavior by the other users cancels out incentives for responsible management that each individual user might have (Barrett, 2005; Gibbons, 1992; Markusen, 1975).

Most of the tourism literature embraces Hardin's view of natural assets (Briassoulis, 2002; Healy, 1994) and expects that each agent seeks his own maximum private benefit, inducing over-degradation of the natural environment and creating an under-efficient welfare scenario (Briassoulis, 2002; Healy, 1994; Huybers & Bennett, 2002, 2003). Thus, free-riding incentives can lead to an immiserizing competition through which no users adopt an environmental friendly position because of fear of being cheated and made worse-off by other agents at the tourist destination. There is empirical evidence in the tourism literature conforming to these expectations, whereby natural resources are overused to the detriment of all (Knowles & Curtis, 1999; Morgan, 1991; Sasidharan et al., 2002). Some examples are the destruction of coral reefs in the Caribbean, disturbance of breeding birds in the Antarctic, pollution through waste and sewage disposal in varied ecosystems, animal harassments by tourist vehicles, and intensive water extraction and depletion of grazing lands (Sasidharan et al., 2002).

Voluntary actions by users of natural resources, however, are also an empirical phenomenon in tourism settings. Unilateral commitments (as with the Tour Operators Initiative for Sustainable Tourism) (WTO, 2002), negotiated agreements (see some examples in Bramwell & Lane, 2000; WTO, 2001), and ecolabels (as in the Blue Flag Campaign and Green Globe) are emerging in many tourism destinations (Buckley, 2002; Font, 2002; Mihalic, 2000; Sasidharan et al., 2002; WTO, 2002). The emergence of these phenomena demonstrates their viability[1].

Voluntary environmental initiatives, then, are widespread in tourism, although they do not necessarily emerge in all situations. This evidence is similar to that obtained for other uses of CPRs (Ostrom, 2000), which has given rise to a broad body of theoretical (Kiser & Ostrom, 1982; Oakerson, 1992; Ostrom, 1990b, 2005, 2007; Ostrom, Gardner, & Walker, 1994a) and empirical (e.g., Agrawal, 2001; McGinnis, 2000) literature to improve our understanding of how humans make use of CPRs and how they act under different incentive structures. This literature, however, has not yet addressed voluntary environmental initiatives and the management of CPRs in tourism. Consequently, the objective of research of this study is to *analyze incentives to undertake voluntary environmental initiatives by the users of CPRs in tourism, and how changes in the institutional setting affect these incentives*. The research scope of voluntary environmental initiatives is too wide to analyze all types of voluntary action in a single study with sufficient

[1] Each of these concepts is described in pages 16-20.

detail. Therefore, we focus on unilateral commitments and ecolabels, leaving aside an analysis of negotiated agreements, which requires the application of a quite different methodology. Taking this into account, some of the research questions addressed in this dissertation are:

1. Which incentives motivate the emergence of voluntary environmental initiatives in tourism?
2. How do institutions affect tourism firms' incentives to undertake voluntary environmental action?
3. Are the effects of command-and-control regulations different from those derived from social norms or self-motivation?
4. Does certification of voluntary environmental initiatives make a difference in the structure of tourism firms' incentives?
5. How does the stock of natural capital affect tourism firms' incentives for undertaking voluntary environmental initiatives?

We address these questions from a conceptual approach embedded in the Institutional Analysis and Development Framework developed by Elionor Ostrom and her colleges at the Workshop in Political Theory and Policy Analysis (Ostrom, 1990b, 2005; Ostrom, Gardner, & Walker, 1994b). As a framework, the IAD is compatible with different theories, including microeconomic theory, game theory, transaction costs theory, social choice theory, public choice theory, constitutional and covenantal theory, and theories of public goods and common-pool resources.

Chapter 2 describes the IAD framework as a theoretical conceptual framework and discusses how it can be applied to tourism settings. The main argument of this chapter is that tourism at nature-based tourism destinations is a complex social-ecological system where social dilemmas[2] regarding the management of natural resources can emerge, though these dilemmas are not inevitable. This chapter considers four broad stakeholders at tourism destinations, namely tourists, tourism firms, government, and residents. The chapter goes on to review relevant literature for the analysis of the economic incentives of these stakeholders for undertaking voluntary environmental initiatives.

This chapter argues that the adoption of the IAD framework by the tourism literature provides research in this area with a shared metatheoretical language and a common set of variables. Chapter 2 presents an example of how one recent extension of the IAD framework designed for social-ecological systems (Ostrom, 2007) can be applied to voluntary environmental initiatives in the tourism industry. This exercise enables us to identify various attributes of the main components of IAD relevant for the success of voluntary environmental initiatives in the tourism industry. This analysis feeds the rest of the dissertation; as subsequent chapters address some of these attributes, namely market conditions, participants, institutions, and quality of the natural CPR, by means of a set of game-theory models.

[2] Social dilemmas are defined in page 13.

These models are developed in the analytic part of this dissertation, which includes chapters 3 to 5. These models share some common **market assumptions**. The main assumption, inspired by empirical evidence, is that tourism firms can charge premiums as a result of their investments in order to become greener. Thus, we develop a family of closely related game-theory models where we consider the same profit functions for tourism firms and address this basic construct from various perspectives.

Different premiums may be in place. Firms that undertake any type of voluntary initiatives can obtain premiums from green differentiation. In addition, firms that adhere to ecolabels can obtain premiums from enhanced reputation. These reputational premiums derive from the fact ecolabels that require higher abatement compromises by firms and monitoring.

Regarding **participants**, of the list of stakeholders presented in chapter 2, our analytical contributions focus on tourism firms. We consider potential heterogeneity in tourism firms in chapters 3 and 4 and homogeneous tourism firms in chapter 5.

In chapters 3 and 4, we address unilateral commitment in non-cooperative one-shot games. These games are developed for *n* players. However, the complexity of dealing with heterogeneity is higher for larger game dimensions (Ostrom et al., 1994a). Therefore, normal form representations for two representative players are presented in order to analyze equilibriums configurations.

Chapter 3 starts by reviewing the literature on the economic consequences of voluntary environmental action taken by tourism firms, extending the review presented in chapter 2 for this particular stakeholder. Empirical research shows that some firms in the tourism industry undertake voluntary environmental initiatives and others do not, and that the former systematically obtain higher economic performance. That is, it pays to be green. We analyze the implications of this evidence under a strategic setting by means of a game with potentially heterogeneous players. In this game, we impose the observed payoff differential and find the payoff structure that leads to a Nash equilibrium with separating strategies.

This first step in understanding the economic incentives of tourism firms for undertaking unilateral commitments is extended in chapters 4 and 5 by including several **institutional changes**. In chapter 4, we modify the payoff functions to incorporate non-monetary motivations and include several institutional changes. Specifically, this chapter compares the effects of formal and informal institutions on unilateral commitments.

First, we consider the potential existence of *shared strategies* or *norms of behavior* among tourism firms, whose observation or violation of these norms may entail non-monetary rewards or punishment from the rest of the group. This justifies the inclusion of a non-monetary parameter in the payoff function, which could also be justified by an intrinsic motivation to make a sustainable use of the

CPR.[3] Second, we analyze the effect that introducing *command-and-control regulations* has on the resulting environmental strategies of firms in scenarios where there is scope for voluntary environmental initiatives. Under the assumption that coercive external intervention crowds-out non-monetary motivations, it is shown that command-and-control intervention might improve environmental contributions, but that public intervention can also reduce environmental activities by users of recreational natural resources.

Third, this crowding-out effect is reinforced when the model allows players to give rise to administrative *corruption*. In chapter 4, tourism firms are allowed to offer monitors bribes in order to obtain individualized exceptions or favorable applications of regulation. In this chapter, conditions for the emergence of corruption are identified. The result is that when corruption is allowed to emerge, the incentives for firms to comply with regulations depend on the expected costs of undercompliance, with those being either the expected fees from breaking regulations or the expected costs of bribery, whichever is cheaper. In addition, the emergence of corruption may have other more profound implications on the strategic environmental decisions of tourism firms. When premiums extracted from engaging in corrupt activities are higher than premiums from green differentiation, the game structure changes. Potential improvements or degradations in environmental quality resulting from a government's intervention become more intense under these circumstances.

Fourth, in chapter 4 we present an extension of the main model and consider the existence of *unregulated tourism operators*, which is a widespread phenomenon in the tourism sector. Thus, in this extension we analyze the effects of developing unilateral commitments under a weak application of formal rules. Through this exercise, we show that it is possible to build scenarios where public interventions are only capable of switching firms' environmental behavior, with no resultant improvement in the quality of the CPR.

Finally, chapter 5 extends some of the prior analysis on unilateral commitments to a dynamic setting and considers the effects of creating an *ecolabel*. As opposed to the introduction of a standard considered in chapter 4, ecolabels do not result from coercive public intervention. Instead, they constitute an institutional change based on the voluntary adherence of firms.

This chapter develops a group of evolutionary games. Methodologically, two primary alternatives for developing dynamic game-theory models are repeated non-cooperative games and evolutionary models. An advantage of evolutionary game theory is that its findings are consistent with empirical evidence on the persistence of stable equilibria (Sethi & Somanathan, 1996). This result is more reasonable than results from non-cooperative repeated games, which allow for any sequence of cooperation and defection to be a possible equilibrium. Further, under evolutionary game theory, history matters for achieving a steady system state, as

[3] The concepts of shared strategies, norms of behaviour, and intrinsic motivation are further explained in pages 15 and 74.

the equilibrium that players eventually reach is determined by the original distribution of players in the population (Mailath, 1998).

There are other features of the model in chapter 5 that differentiate it with respect to previous chapters. First, consistent with the methodology it uses, the model explicitly solves for an indefinite number of players, *N*, who are considered homogeneous. Second, we eliminate non-monetary motivational factors. Third, natural capital is endogenized as a renewable resource. We assume that the **quality of the natural CPR** is an additional factor affecting incentives for undertaking voluntary environmental initiatives. Specifically, we assume that premiums from voluntary environmental action positively depend on quality of the natural CPR used by tourism firms.

An initial version of the model, which extends the model in chapter 3, considers two strategies of behavior. These strategies are just meeting environmental regulations or unilaterally implementing larger abatement efforts. We carry out a complete analysis of existence and stability conditions for steady states and for dynamics when out of equilibrium. The model shows that, contrary to results of closely related literature (Osés & Viladrich, 2007; Sethi et al., 1996), environmental initiatives can arise even in the absence of non-monetary motivational factors or punishments.

A second version of the model considers a third available strategy, adhering to an ecolabel. This strategy entails higher costs related to greater abatement requirements (and other possible sources), but produces positive reputation effects for ecolabel members. A complete analysis of existence and stability conditions for long run equilibria is again performed.

We do not explicitly model the process of ecolabel creation. Rather, we use the analysis of dynamics when out of equilibrium to explore the effects of an exogenous implementation of the ecolabel. It turns out that the initial proportion of firms that adhere to an ecolabel (the promoters), the composition of this promoters set, the degree of unilateral initiative implementation prior to the ecolabel, and the quality of the natural CPR all play a role in determining the success or failure of the ecolabel. The viability of the ecolabel also depends on the initiative's institutional design and the regulatory environment. This is shown through sensitivity analyses that reveal several bifurcation values of selected parameters in the model.

Finally, chapter 6 concludes. This chapter summarizes the main findings of the dissertation. In addition, we discuss the dissertation research's limitations of and offer some lines of future research.

Figure 1.1 below presents an overview of the contents developed in each chapter of the dissertation[4].

[4] Chapters have been developed as self-contained research units that can be read out of context of the overall dissertation. This comes at the cost of some inevitable repetition for a reader of the complete dissertation.

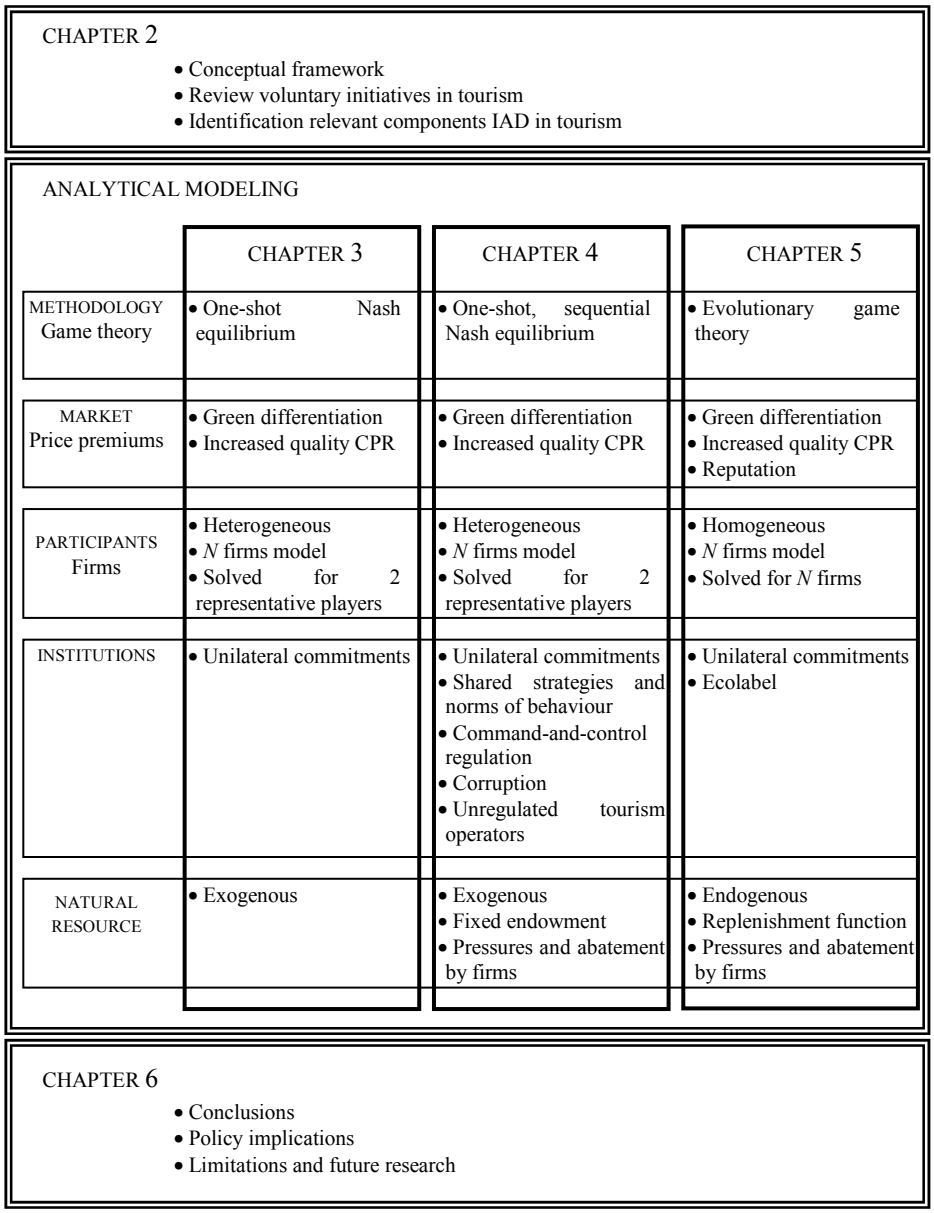

Fig.1.1 . Content overview of the dissertation.

References

Agrawal, A. (2001). Common property institutions and sustainable governance of resources. *World Development*, 29, 1649-1672.

Alberini, A., & Segerson, K. (2002). Assessing voluntary programs to improve environmental quality. *Environment & Resource Economics*, 22, 157-184.

Andrews, R. (1998). Environmental regulation and business `self-regulation´. *Policy Sciences*, 31, 177-197.

Arimura, T., Hibiki, A., & Katayama, H. (2008). Is a voluntary approach an effective environmental policy instrument? A case for environmental management systems. *Journal of Environmental Economics and Management*, 55, 281-295.

Barrett, S. (2005). *Environment and statecraft: the strategy of environmental treaty-making*. Oxford: Oxford University Press.

Bramwell, B., & Lane, B. (2000). Collaborations and partnerships in tourism planning. In B. Bramwell, & B. Lane (Eds.), *Tourism collaborations and partnerships: Politics, practice and sustainability* (pp. 1-19). Clevedon: Channel View Publications.

Briassoulis, H. (2002). Sustainable tourism and the question of the commons. *Annals of Tourism Research*, 29, 1065-1085.

Buckley, R. (2002). Tourism ecolabels. *Annals of Tourism Research*, 29, 183-208.

Dawson, N. L., & Segerson, K. (2008). Voluntary agreements with industries: Participation incentives with industry-wide targets. *Land Economics*, 84, 97-114.

Font, X. (2002). Environmental certification in tourism and hospitality: progress, process and prospects. *Tourism Management*, 23, 197-205.

Gibbons, R. (1992). *A primer in game theory*. New York: Harvester Wheatsheaf.

Glachant, M. (2007). Non-binding voluntary agreements. *Journal of Environmental Economics and Management*, 54, 32-48.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 163, 1243-1248.

Hardin, G. (1998). Extensions of "The Tragedy of the Commons". *Science*, 280 (5364), 682-683.

Healy, R. (1994). The "common pool" problem in tourism landscapes. *Annals of Tourism Research*, 21, 596-611.

Huybers, T., & Bennett, F. (2002). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2003). Environmental management and the competitiveness of nature-based tourism destinations. *Environmental and Resource Economics*, 24, 213-233.

Khanna, M. (2001). Non-mandatory approaches to environmental protection. *Journal of Economic Surveys*, 15, 291-324.

Kiser, L., & Ostrom, E. (1982). The three worlds of action: A meta-theoretical synthesis of institutional approaches. In E. Ostrom (Ed.), *Strategies of Political Inquiry* (pp. 179-222). Beverly Hills, CA: Sage.

Knowles, T., & Curtis, S. (1999). The market viability of European mass tourist destinations. A post-stagnation life-cycle analysis. *International Journal of Tourism Research*, 1, 87-96.

Lyon, T., & Maxwell, J. (2002). "Voluntary" approaches to environmental regulation. In M. Franzini, & A. Nicita (Eds.), *Economics Institutions and Environmental Policy* (pp. 75-120). Brookfield, Vermont: Ashgate Publishing.

Mailath, G. (1998). Do people play Nash equilibrium? Lessons from evolutionary game theory. *Journal of Economic Literature*, XXXVI (September), 1347-1374.

Markusen, J. R. (1975). Cooperative Control of International Pollution and Common Property Resources,. *Quarterly Journal of Economics*, 89, 618-632.

McGinnis, M. (2000). *Polycentric games and institutions: readings from the Workshop in Political Theory and Policy Analysis*. Ann Arbor: University of Michigan Press.

Mihalic, T. (2000). Environmental management of a tourist destination. A factor of tourism competitiveness. *Tourism Management*, 21, 65-78.

Morgan, M. (1991). Dressing up to survive: Marketing Majorca anew. *Tourism Management*, 12, 15-20.

Oakerson, R. (1992). Analyzing the Commons: A framework. In D. Bromley (Ed.), *Making the Commons Work: Theory, Practice and Policy* (pp. 41-59). San Francisco: Institute for Contemporary Studies.

Osés, N., & Viladrich, M. (2007). On the sustainability of common property resources. *Journal of Environmental Economics and Management*, 53, 393-410.

Ostrom, E. (1990a). *Governing the commons: The evolution of institutions for collective action* (17th ed.). New York: Cambridge University Press.

Ostrom, E. (1990b). *Governing the commons: The evolution of institutions for collective action* (17th ed.). New York: Cambridge University Press.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives*, 14 (3), 137-158.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. *PNAS*, 104, 15181-15187.

Ostrom, E., Gardner, R., & Walker, J. (1994a). *Rules, games and common pool resources* (7th ed.). Ann Arbor: University of Michigan Press.

Ostrom, E., Gardner, R., & Walker, J. (1994b). *Rules, games and common pool resources* (7th ed.): The University of Michigan Press.

Sasidharan, V., Sirakaya, E., & Kerstetter, D. (2002). Developing countries and tourism ecolabels. *Tourism Management*, 23, 161-174.

Sethi, R., & Somanathan, E. (1996). The evolution of social norms in common property resource use. *American Economic Review*, 86, 766-788.

Stoeckl, N. (2004). The private costs and benefits of environmental self-regulation: which firms have most to gain? *Business Strategy and the Environment*, 13, 135-155.

WTO (2001). *Public-Private Sector Cooperation: Enhancing Tourism Competitiveness.* Madrid: World Tourism Organization.

WTO (2002). *Voluntary initiatives for sustainable tourism: Worldwide inventory and comparative analysis of 104 eco-labels, awards and self-commitments*. Madrid, Spain: WTO.

Chapter 2: Voluntary environmental initiatives in tourism: an study under the Institutional Analysis and Development Framework

2.1. Introduction

Tourism destinations have realized the importance of increasing their competitiveness on the international stage. This realization has given rise to a broad body of literature analyzing the determinants of competitiveness and the interrelationships between these determinants. Within this context, environmental concerns have become an issue of major importance (Albrech, 1998; Butler, 1980; Goeldner & Ritchie, 2003; Hassan, 2000; Hjalager, 1996; Hudson, Ritchie, & Seldjan, 2004; Huybers & Bennett, 2002b, 2003; Ritchie & Crouch, 2000, 2003; WTO, 2004).

As a result, the tourism literature has increasingly recommended the adoption of sound environmental policies at destinations, in order to preserve their appeal. In the past, policy prescriptions have mainly been based on traditional views established in the tragedy of the commons (Hardin, 1968) and the destination life-cycle model (Butler, 1980). Both theories predict the inevitable degradation of natural assets by overuse, demanding external interventions governing the behavior of users to avoid tragedy outcomes. The tourism literature has favored, in a certain way, this view of environmental management when describing the inexorable environmental impoverishment of destinations as they grow (Knowles & Curtis, 1999; Morgan, 1991). Tourism expansion has been generally described as entailing congestion, degradation of natural assets, weak management of waste effluents, and other negative impacts that have become the basis of the extensive literature on the ecological impacts of tourism (see examples in Sasidharan, Sirakaya, & Kerstetter, 2002). As Green et al. (1990:p.112) stated, "the literature of tourism has concentrated largely on the negative impacts of tourism development and the potentially destructive force which poorly managed tourism developments can create."

In recent times, this pessimistic view has broadened into a more balanced analysis of the positive and negative impacts of tourism, centering on the sustainability principle. Concurrently, there is a growing empirical observation of the tourism industry's voluntary environmental initiatives. The expansion of voluntary environmental initiatives has profound policy implications, as it reflects major changes in governance in many Western countries (Bramwell & Lane, 2000).

Understanding these self-organizing initiatives by tourism stakeholders is particularly relevant when one considers that the analysis of governance structures is concerned with issues or policies that go beyond basic tourism questions, and have

broader economic, social, and environmental dimensions (Bramwell et al., 2000; Bramwell & sharma, 1999). For example, the mismanagement of natural resources by the tourism industry can generate social conflict and residents' mobilization against tourism activities (Kousis, 2000) due to residents' concerns about the environmental impacts of tourism (see Bujosa & Rosselló, 2007; Kuvan & Akan, 2005; Liu, Sheldon, & Var, 1987 among others).

The objective of the present chapter is to describe one approach to institutional analysis, the Institutional Analysis and Development (IAD) framework, and discuss how it can be used to analyze voluntary environmental initiatives at tourism destinations. The IAD framework is well established in political science (Peters & Pierre, 2006; Sabatier, 1999), and we believe that it can provide the tourism literature with a language and theoretical conceptual organization, to bring this literature into the mainstream. Our argument is that the IAD, as a conceptual framework designed to deal with complex relations between institutions and the behavior of individuals (and given its extensive application to common-pool resource (CPR) situations), is suitable for application to the multifaceted tourism phenomenon. Tourism is a truly complex economic activity, where multiple agents make different use of diverse CPRs. Tourism's complexity might be comparable, however, to non-tourism usage of forests or coastal areas, where use and non-use values can coexist for a multiplicity of agents who are stakeholders in those settings.

This chapter first reviews the existing literature on CPRs and voluntary environmental initiatives in tourism. This review shows that CPR situations have been described in the tourism literature as social dilemmas, and that there are monetary and non-monetary incentives for stakeholders to develop voluntary environmental initiatives. Moreover, we identify certain limitations to this literature, which may be (at least) partially overcome through the application of an IAD framework. Second, an institutional perspective for voluntary environmental initiatives is offered. The IAD framework developed by Elionor Ostrom and her colleges in the Workshop in Political Theory and Policy Analysis (Ostrom, 1990, 2005d; Ostrom, Gardner, & Walker, 1994b) is presented, jointly with its main working components. Then, we introduce a particular theoretical use of the IAD framework to analyze complex social-ecological systems recently developed by Ostrom (2007). Ostrom's work (2007) is used to describe the main components of the tragedy of the commons and the development of voluntary environmental initiatives in nature-based tourism destinations. Finally, section 2.4 concludes.

2.2. Voluntary environmental initiatives in tourism

Economic theory has long acknowledged the special characteristics of CPRs: those of being substractable and nonexcludable. These terms refer, respectively, to resources for which exploitation by one user reduces the amount available to others, and to situations in which the exclusion of potential appropriators is difficult (for a thorough discussion of the CPRs and the problems related to their usage see Ostrom, Gardner, & Walker, 1994a).

Garrett Hardin, in his influential article "*The Tragedy of the Commons*" (1968), presents the management of CPRs as a trap for users. He details a situation in which rational users of a resource seek to maximize their private gain, demanding additional units of the resource until his or her actions equal the expected costs, which are shared by all users. As he states,

> "…therein is the tragedy. Each main is locked into a system that compels him to increase his herd without limit- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a common brings ruin to all" (Hardin, 1968:1244).

Since then, the expression "the Tragedy of the Commons" has come to symbolize the degradation of the environment through its overuse. As a result, Hardin's work has been used by many scholars and policy-makers to rationalize central governmental control of CPRs and to paint a pessimistic vision of humanity (Ostrom, Burger, Field, Norgaard, & Policansky, 1999).

Hardin (1968) argues that CPRs will inevitably lead to social dilemmas; "situations where everyone is tempted to take one action but all will be better off if all (or most of them) take another action" (Ostrom, 2005d:p.79). The view of CPRs as social dilemmas has inspired much research in the natural and social sciences, including in ecology, health care, economics, population studies, law, political science, philosophy, ethics, geography, psychology, and sociology (Hardin, 1998).

Contrary to Hardin's view (1968), however, not all CPR situations are social dilemmas (Ostrom et al., 1994a). Two conditions are necessary for a CPR situation to be characterized as a social dilemma: (1) the demand for resources is sufficiently large to motivate users to pursue their own selfish interest, producing suboptimal outcomes; and (2) possible institutional alternatives that generate better outcomes exist (Ostrom et al., 1994a). Users of a CPR might face two social dilemmas at different levels (Ostrom, 2000). In the fist-level dilemma, each individual would like others to refrain from using the resource while wanting to use it freely themselves. The second-level dilemma is related to the efforts of users to change institutions, since the creation of new institutions to better manage the resource that they share is a public goods problem. In this dissertation, we consider strategic decisions aimed at improving outcomes in the former dilemma and the consequences of successfully solving the latter dilemma.

The tourism literature identifies CPRs as social dilemmas in tourism settings, and is beginning to consider the emergence of voluntary initiatives aimed at avoiding tragedy outcomes. The tourism product, in general, is understood as both a composite commodity and a mixed good. Certain portions of the product are private goods, while others include collective or purely public goods, open access commodities, and external consumption elements (Tisdell, 2001). As such, a portion of tourism resources, including natural assets, are in fact tourism CPRs (Healy, 1994). Some examples are ski areas, forest land, wildlife areas, a lake, a river basin, an estuary, a piece of shoreline, a diving area, fresh- and salt-water ponds, and caves (Healy, 1994; Imperial, 1999b).

Considering the existence of tourism CPRs, and building on Hardin's view , the *Tragedy of the Tourism Commons* has been postulated for tourism destinations (Briassoulis, 2002). Accordingly, the tourism commons are alleged to be subject to characteristic problems of overuse, lack of incentives for investment, and general mismanagement (Briassoulis, 2002; Healy, 1994; Sinclair & Stabler, 1997:155-181). Some consider this particularly relevant when one takes into account the importance of environmental quality for the tourism product. CPRs are alleged to be an indispensable resource base for the integrity of the tourism experience (Briassoulis, 2002). Despite the fact that there are some tourism destinations where the tourism product is separate from natural attractions, the quality of the experience at many others, particularly nature-based tourism destinations, is directly related to the quality of the environment (Huybers et al., 2002b). As Goeldner and Ritchie (2003:p.462) put it, "the environment is the core of the tourism product. Profitability in tourism depends on maintaining the attractiveness of the destination people want to see and experience."

Thus, some argue that the degradation of natural assets reduces the quality of an important component of the tourism product, and consequently, the viability of the destination itself (Briassoulis, 2002). The result is that the idea of a tragedy in tourism is extended into the *Tragedy of the Tourism Product* (Briassoulis, 2002). Overall, the existence of a social dilemma in managing tourism CPRs has been anticipated. Agents are expected to systematically free-ride on others' efforts, and therefore the theory predicts no voluntary action for environmental protection. More broadly, Huybers and Bennett (2002a) describe the interactions between tourism firms, using certain key natural attractions, as a social dilemma of independence in the face of interdependence.

There are examples of tourism destinations that have actually overexploited their CPRs, thereby losing their tourism appeal and undergoing stagnation (Butler, 1980; Knowles et al., 1999; Morgan, 1991). These are examples of situations where, as the destination evolves, demand for tourism CPRs increases until it becomes sufficiently large to induce agents to overuse resources, generating clearly suboptimal outcomes of destination stagnation. Nevertheless, stakeholders at some destinations have initiated voluntary initiatives to preserve their natural resources (see UNEP, 1998; WTO, 2002, 2003; 2004 for extensive lists of these initiatives),

constituting viable alternative governance of the social-ecological systems in the tourism industry.

2.2.1. Monetary and non-monetary incentives to voluntary environmental initiatives in tourism

Non-mandatory approaches to environmental protection include a diverse set of efforts that can be classified into three broad categories. This categorization depends on the degree of regulator, or other third party, involvement, and consists of unilateral commitments, negotiated agreements, and certified voluntary programs (Delmas & Keller, 2005; Khanna, 2001). All of these are considered voluntary initiatives, since their promoters are not obliged by law to launch the scheme, and target groups are not obliged to apply or join (WTO, 2002).

Given their non-mandatory nature, some economic literature argues that voluntary programs must generate short-term economic gains in order to promote compliance, since participation is self-enforcing (Alberini & Segerson, 2002; Dawson & Segerson, 2008; Khanna, 2001). Nevertheless, players usually hold information about each other and information about the context in which the social interaction occurs. These pieces of information are defended as relevant in decision-making processes by influencing non-monetary attributes in stakeholders' preferences (Cardenas & Ostrom, 2004). These wider preferences might result from intrinsic motivation and/or informal social benefits derived from following norms of behavior or shared strategies among users. Agents are considered intrinsically motivated to perform an activity when they receive no apparent reward except performing the activity itself (Deci, 1971). Thus, intrinsic motivation refers to the way in which stakeholders prefer to behave (disregarding monetary outcomes) and the outcomes they wish to obtain for themselves and for others (Crawford & Ostrom, 1995). Norms of behavior or shared strategies are a second source of non-monetary preferences. Contributing to an adequate management of a natural resource may be positively recognized by other users of that resource, entitling agents who follow norms to become part of a group and obtain advantages as a result (Crawford et al., 1995; Osés & Viladrich, 2007; Tarui, Mason, Polansky, & Ellis, 2008)[1].

In the following section, we review the incentives that stakeholders at tourism destinations might have for undertaking different types of voluntary initiatives for environmental protection within the tourism industry. The literature mostly refers to monetary incentives (e.g., profitability, occupancy rates), but we also consider non-monetary incentives whenever possible.

[1] These advantages can be (Osés et al., 2007): social inclusion and public consideration, everyday favors and signs of approval that make life easier and more pleasant, moral support in difficult circumstances, and various bestowals and positions.

Unilateral commitments

Unilateral commitments refer to uncertified environmental practices (e.g., environmental codes of conduct; Mihalic, 2000). Different stakeholders in the tourism industry can undertake individual voluntary activities to improve their environmental sensitivity. We consider four broad groups of stakeholders in the tourism industry, namely, tourists, residents, the public sector, and tourism firms. In this section, we study incentives for these agents to engage in unilateral commitments using various types of analysis and achieving different degrees of consensus in terms of the results.

First, tourists are the consumers of tourism goods and services. Therefore, their commitment to greener patterns of consumption can affect the environmental performance of the tourism industry as a whole. One prerequisite for tourists to be willing to carry out unilateral commitments is for them to care about environmental quality. In the tourism literature, it is conventional to assume that environmental quality has a positive effect on tourists' preferences (for example, Alegre & Cladera, 2006a; and Alegre & Juaneda, 2006b, for the empirical literature; and Gómez, Lozano, & Rey-Maquieira, 2008; Rey-Maquieira, Lozano, & Gómez, 2005 for the analytical literature). This is consistent with various studies that find that tourists are willing to pay extra for an environmentally friendlier industry and for improvements in environmental quality at tourist destinations (some examples are Dodds & Joppe, 2005; Huybers & Bennett, 2002c; PATA, 2007). Thus, tourists do seem willing to compromise for better environmental performance of the tourism industry.

Second, tourism usually takes place in areas where there is a local population. Empirical evidence shows that residents are concerned with the environmental impacts of tourism (Bujosa et al., 2007; Kuvan et al., 2005; Liu et al., 1987). Further, there are many studies demonstrating that residents are willing to pay for increased environmental quality of natural resources. For example, research has analyzed the benefit to residents derived from good quality aquatic and related terrestrial ecosystems, including beach use, swimming, fishing, boating, and pollution avoidance (WSTB, 2004). Also noteworthy are studies estimating the value placed by residents on amenity services derived from agricultural land use, as opposed to development (Brunstad, Gaasland, & Vardal, 1999; Drake, 1999; Lopez, Shah, & Altobello, 1994). Additionally, the literature has described mobilizing efforts by residents to demand more responsible environmental policies in the tourism industry (Kousis, 2000).

Third, despite the rich literature in political economics (Persson & Tabellini, 2000), the public sector's incentive structure has remained largely neglected in the analysis of environmental management of tourism destinations. The common and often implicit assumption in the tourism literature of benevolent planners avoids the problem of understanding the underlying incentives of the government, as it identifies government's preferences as concern for aggregate social welfare (Albrech, 1998; Edgell, 2002; Goeldner et al., 2003; Palmer, Oates, & Portney,

1995; Porter & Van der Linde, 1995a, 1995b; Ritchie et al., 2003). However, agency problems abound in modern political systems (Laffont & Martimort, 1999) and other motivations often lie behind government actions, such us pure rent-seeking by political representatives (Brennan & Buchanan, 1980) or opportunistic vote-maximizing behavior and lobbying (Becker, 1983; Canan & Hannessy, 1989; Madrigal, 1995). Notwithstanding these motivations, political competition in modern democracies may still drive the government toward policies that are beneficial for broad segments of citizens (Wittman, 1989, 1995). It is therefore reasonable to consider the existence of scenarios whereby the government has incentives to promote and participate in unilateral commitments to improve environmental management.

Lastly, for tourism firms, there is an open debate about whether they have incentives for developing unilateral commitments. The academic literature addressing the monetary and non-monetary incentives of tourism firms is both recent and scarce. The literature addressing economic incentives is beginning to understand the forces behind the environmental-economic relationship. Based on cluster analysis techniques, it has been shown either that more environmentally proactive groups enjoy significantly higher economic results (Álvarez, Burgos, & Céspedes, 2001), or that environmental laggards significantly underperform (Carmona-Moreno, Céspedes-Lorente, & de Burgos-Jimenez, 2004). In addition, structural equation models show that environmental practices, built into service design, positively impact customer satisfaction and loyalty, thereby improving the performance of firms (Kassinis & Soteriou, 2005). This partial evidence suggests that, at least for a certain proportion of firms in the tourism industry, it pays to undertake individual voluntary environmental action (a thorough review of these studies is presented in Blanco, Rey-Maquieira, & Lozano, 2009)[2].

In addition to economic aspects, there is evidence of other motivations for tourism firms to perform greener. One example of the impact of social pressure on the tourism industry is whale watch in Vancouver Island, Canada. Local ecotour operators usually prevent the flow of information about whale sightings to other operators who engage in inappropriate behavior (Sirakaya, 1997; Sirakaya & Uysal, 1997). Another example comes from a study of 27 firms close to a UK national

[2] Apart from individual incentives, stakeholders might have strategic incentives for undertaking unilateral commitments. Stakeholders may decide on environmental actions based on expectations of others' behavior. Studies addressing the strategic incentives of agents for investing in the maintenance of the tourism commons are scarce (examples are Calveras & Vera-Hernández, 2005; Candela & Cellini, 2006; González, León, & Padrón, 2006; Pintassilgo & Albino, 2007). Additionally, this research suffers from important limitations. First, it is strictly theoretical in its analysis. Second, these studies have only considered the environmental behavior of tourism firms, ignoring intra-agent coordination by the other groups of stakeholders (such as tourists, residents, or public administrations). Third, some of the applications address environmental competition between destinations, but do not address the strategic behavior of agents within each destination (e.g., Candela et al., 2006; Faria, 2008). Fourth, specifications of models rely on the conventional assumptions behind the tragedy of the commons, wherein environmental management is costly for all agents and the demand effects are only partially considered.

park, which revealed that small tourism firms are influenced by a range of different factors that combine to shape their response to sustainability, only some of which are commercially-based (Dewhurst & Thomas, 2003). Further, empirical evidence shows cases where there is a positive influence on compliance results from publicizing the names of noncompliants, whereas other types of sanctions are insignificant in explaining compliance (Sirakaya, 1997; Sirakaya et al., 1997).

The same research reveals that personal morality has a positive relationship with guideline compliance by eco-tour operators, and is also the most important factor in explaining their compliance behavior (Sirakaya, 1997; Sirakaya et al., 1997). Other findings show that firms that believe they have a responsibility for addressing environmental matters are significantly more involved in voluntary environmental initiatives (Dewhurst et al., 2003; Sirakaya, 1997; Sirakaya et al., 1997). Lastly, local owners of firms might be more motivated to undertake responsible environmental strategies due to their more personal attachment to the destination as compared to foreign owners (Brohman, 1996; Duffy, 2000; Kusluvan & Karamustafa, 2001; Sekhar, 2003). Also, smaller operators may be particularly concerned about the sustainability of an area (Dewhurst et al., 2003).

Consequently, it can be defended that, at least for a subset of firms in the tourism industry, the incentives for free-riding on others' environmental actions are partially or totally compensated for by extra profits and/or intrinsic or social rewards by individual firms undertaking environmental initiatives.

Negotiated agreements

Negotiated agreements involve negotiations between regulators or other third parties and an individual or group of firms on abatement targets and plans. Tourism Collaborations[3] and Partnerships[4] for Sustainability are types of negotiated agreements that are being developed in the tourism industry. In both cases, the core principle is the voluntary engagement of stakeholders to solve a common problem. Negotiated agreements for tourism's environmental management involve interactions between stakeholders who may be in the public, semi-public, private, or voluntary sectors, including pressure and interest groups (Bramwell et al., 2000).

The tourism literature has justified the creation of tourism collaborations and partnerships for sustainability, based on the existence of environmental problem domains at destinations. A problem domain is defined as a system-level challenge composed of numerous parts, over which no single agent has complete authority (Parker, 1999). Parker (1999) argues that as the destinations become more devel-

[3] Collaboration is generally defined as "a process of joint decision making among key stakeholders of a problem domain about the future of that domain" (Gray, 1989:p.11).

[4] Partnerships are more specific in their definition and refer to interactions between parties sharing common interests or resources intended to address a common issue or to achieve a specific policy goal that cannot be addressed individually (Bramwell et al., 2000; Selin, 1999).

oped, derived consequences evolve from small, discrete problems to single but multi-dimensional and interdependent problem domains. Thereafter, agents at the destination become unable to address the situation in isolation, and collaboration becomes needed. It is believed that, as the issues in the problem domains are more likely to be effectively dealt with by collaborations and partnerships than by external solutions, agents generate cooperative ventures in order to more effectively address their environmental problems (Waddock, 1989). These coordinative practices for achieving environmental protection have been broadly used (see the special edition of the Journal of Sustainable Tourism Vol. 7, nos. 3&4, 1999; Bramwell et al., 2000; WTO, 2001).

The existence of problem domains at tourism destinations constitutes a justification of why collaborations and partnerships for sustainability emerge at tourism destinations. However, the mechanisms by which agents are able to overcome their free-riding incentives and coordinate environmental actions (i.e., how these initiatives emerge) are less clear. According to Bramwell (2000:p.3), "despite increasing interest in tourism partnerships, until recently there has been little systematic research on the internal processes and external impacts of these organizational forms. Information (…) can be limited by a tendency to condense complex processes into simple description, to avoid analysis and criticism…".

Certified voluntary programs

An ecolabel is a certified voluntary program that implies the certification of a particular level of environmental performance in the production of a tradable product or service[5] (Buckley, 1992). Certified voluntary programs primarily involve firms and governments or NGOs, but other stakeholders are also involved in various ways (e.g., assessing the design of the program or monitoring compliance with criteria). Ecolabels in tourism are often organized by institutions external to the industry (87 percent of ecolabels are organized by governmental agencies or NGOs; WTO, 2002), require assessment of participants (Font, 2002; UNEP, 1998), and must generate a positive image with consumers and other stakeholders (UNEP, 1998; WTO, 2002).

The origins of ecolabels stem from the manufacturing industry, which has greater direct and measurable environmental impacts, clearer operating systems, and larger organizations (Tribe, Font, Griffiths, Vickery, & Yale, 2000). Ecolabels began in the tourism industry in the mid-eighties, and were further developed in the nineties (Font, 2002). In 2002, the World Tourism Organization identified approximately 60 tourism ecolabels, reaching approximately 7,000 tourism products certified worldwide in 2001 (WTO, 2002). Some argue that these are the voluntary

[5] In the literature there is not terminological consensus in the use of "ecolabel" and "certified voluntary programs" (Brau & Carraro, 2004; Khanna, 2001; Lyon & Maxwell, 2002, 2008; Portney, 2008). In this dissertation we opt to use both terms indistinctly.

initiatives with the highest potential to move the market towards an environmentally sensitive recreational industry (Mihalic, 2000; WTO, 2002).

The effectiveness of ecolabels depends on three crucial factors (WTO, 2002): First, it is necessary for the target group to have substantial potential for improving their environmental performance (Sasidharan et al., 2002; UNEP, 1998; WTO, 2002). Ecolabels must improve environmental performance above legal compliance in order to achieve relevant improvements in their main problems, and must also contain substantive criteria for distinguishing members from non-members (Buckley, 2002; UNEP, 1998). Second, it is necessary that clients view ecolabels as adding quality. Quality signals through ecolabels and other informational disclosures has been shown to strengthen market incentives for voluntary action without the need of governmental imposition (Khanna, 2001). When consumers become aware of the environmental achievements of ecolabeled firms, short/medium term benefits for members might result from increased competitiveness. For example, empirical findings show that hotels with higher levels of environmental performance, and which are enrolled in ecolabels, charge significantly higher room prices (about $30 per night more than the room prices of non-member hotels, according to Rivera, 2002). Additionally, the Green Tourism Business Scheme in Scotland has reported almost 10% higher occupation rates from certified establishments (Font, 2002). The high level of consumer response to ecolabeled products has been defended as one of the most telling indicators of strong environmental concern among the general public in many developed nations (Buckley, 2002). Third, to become viable in constituting a real consumption alternative, ecolabels must include a minimum of 3 to10 percent of the firms operating in a region (WTO, 2002). This constitutes the minimum contributing set of firms joining an ecolabel to credibly present a certification program to the tourism market (Font, 2002) and offer a real consumption choice to tourists (WTO, 2002). These figures are slightly lower than those for manufacturing, where current ecolabeling systems are usually designed to cover between 5 and 20 percent of the market (Amacher, Koskela, & Ollikainen, 2004).

2.2.2. Limitations of the literature on voluntary environmental initiatives in tourism

The main finding in the literature on the tourism industry's voluntary environmental initiatives is that there are tourism stakeholders who have been able to undertake voluntary environmental initiatives invalidating tragedy as the only possible outcome. This evidence parallels results for other CPR situations and shows that the prediction from mainstream economics of inevitable zero voluntary cooperation within a large-group commons problem is too pessimistic in the case of tourism (see Marshall, 2005; Ostrom, 2000; Ostrom et al., 1999. This finding is also supported with non-tourism CPRs).

Nevertheless, the literature on voluntary environmental initiatives is recent and still scarce in the case of tourism. Most empirical research to date on such initiatives has been based on case study methods (see the special edition of the Journal of Sustainable Tourism Vol. 7, nos. 3&4, 1999; Bramwell et al., 2000; Dewhurst et al., 2003; Morgan, 1991; Sirakaya, 1997; Sirakaya et al., 1997), though some comparative analyses between voluntary initiatives have also been undertaken (UNEP, 1998; WTO, 2002).

The literature on tourism industry's voluntary environmental initiatives has not yet been deeply connected to the well-rooted mainstream literature on institutions and CPR management (see Baland & Platteau, 1996; Ostrom, 1990; Ostrom et al., 1994b; Wade, 1988 for some book-length analyses in the mainstream literature). In addition, few contributions have been made that develop theoretical frameworks for analyzing self-organization in tourism policymaking (some examples are Bramwell et al., 1999; Jamal & Getz, 1995; Reed, 1999; Selin, 1999). As Bramwell (2000) argues, we need to develop analytical frameworks that assist researchers in understanding the process behind voluntary environmental management in tourism planning.

The mainstream literature on institutions and CPR management has benefited from contributions from political science, economics, anthropology, law, sociology, psychology, and other disciplines (Ostrom, 2005c). The tourism literature could build on this previous knowledge to stimulate a wider recognition of the relevance of CPRs in the tourism industry, and to rigorously advance a better understanding of how individuals make decisions under different contextual situations.

Moreover, the widespread problems of incomplete model specification and omitted variables in the mainstream empirical CPRs literature, as described by Agrawal (2001), is also characteristic of the tourism CPR literature. Agrawal (2001) notes that an important reason for this problem is the lack of a single widely accepted theory for the sustainability of common property institutions. This problem might be even greater in the tourism literature, where the theoretical aspects of voluntary environmental initiatives have not been developed with the same intensity. To address these problems, Agarwall (2001) encourages paying careful attention to research design, index construction (to reduce the number of variables in a given analysis), and comparative rather than cases study analyses. He advocates for a new research path that postulates causal links investigated through structured case comparisons. These comparisons should use a large number of cases that are purposefully selected on the basis of causal hypotheses, and the researcher should undertake statistical tests to examine the strength and direction of causal relationships.

2.3. An institutional perspective on tourism industry's voluntary environmental initiatives

Institutions can be defined as enduring regularities in human action (Crawford et al., 1995). This includes repetitive and structured interactions within families, neighbourhoods, markets, churches, private associations, and governments (Ostrom, 2005c). Therefore, the concept of an institution applies broadly and contains much variability. Relevant here is that institutions can promote socially beneficial outcomes by helping resolve social dilemmas (Imperial, 1999a). This is the case since institutions, or the absence of institutions, determine the opportunities and constraints individuals face in any particular situation. Institutions also determine the information and benefits individuals obtain or are excluded from, and how they make sense of situations (Ostrom, 2005c). Thus, the emergence of voluntary agreements in the tourism industry is consistent with the broader finding that users of CPRs frequently develop their own institutions, operating without formal governmental jurisdictions (Ostrom, 2000). Voluntary environmental initiatives represent an internally motivated institutional change towards environmental self-regulation by incorporating environmental concerns in decision-making (Anton, Deltas, & Khanna, 2004). Stakeholders can change the institutional context in which they are embedded, without needing external imposition.

Potential implications of institutional change by means of voluntary environmental initiatives extend beyond questions in the tourism industry. Institutional structures influence the capacity of stakeholders to participate in making and implementing decisions[6] (Reed, 1999). Consequently, self-organizing institutions that enable stakeholders to participate in environmental tourism policies can bring democratic empowerment, equity, operational advantages, and an enhanced tourism product (Jamal et al., 1995; Joppe, 1996; Timothy, 1999).

Moreover, the development of voluntary environmental initiatives in the tourism industry is closely related to environmental quality at the destination, as well as attributes of the host community. The emergence of conflict in any of these two areas can compromise future developments in the industry.

All of these considerations can be analyzed under the IAD framework.

[6] For example, firms may change their responses to pressures from environmental groups and other social interests towards more pacifying positions when they fear the threat of increased regulation or a change in governance. It is unlikely that profit-oriented firms will acquiesce to pressures from environmental groups and other social interests when business interests dominate the policymaking process. However, they will do so when policymaking is socially oriented and interest groups increase and sustain the visibility of an issue in the media and in the awareness of the general public (Cashore & Vertinsky, 2000).

2.3.1. The Institutional Analysis and Development Framework

The IAD framework has its roots in classic political economy, neoclassical micro-economic theory, institutional economics, public choice theory, transaction-costs economics, and non-cooperative game theory (Ostrom et al., 1994b). Its objective is to develop a conceptual approach integrating the work undertaken by different disciplines interested in analyzing how institutions affect the incentives of individuals, as well as resulting behavior, with a higher accumulative capacity than in many of the separate research lines being developed in contemporary social sciences (Ostrom, 2005c).

There is a wide variety of empirical settings in which the IAD has helped scholars undertake a systematic analysis of the situational structures faced by individuals, as well as the role of institutions. This includes land boards, government development projects, coffee cooperatives, property-right changes, housing condominiums, regulation of the phone industry, day-care centers, banking reforms, international aid, and (most importantly in terms of number of applications), the study of rules and outcomes of CPR settings (Ostrom, 2005c). Applications related to CPRs are also most important to the purposes of this chapter. In this respect, the IAD can help scholars understand how rules affect the behavior and outcomes achieved by individuals using CPRs (Ostrom et al., 1994b).

The main argument of the IAD framework is that the diversity of regularized social behavior that we observe along multiple scales consists of several layers of universal components that create structures affecting the behavior of interdependent individuals, as well as the outcomes they receive. That is, the IAD stresses a universality of working parts. Further, to facilitate cross-disciplinary research, the IAD framework develops a metatheoretical language that is broader than the theoretical language of any particular discipline.

The IAD framework considers (a) *participants* in an (b) *action situation* who (c) *interact* with the components of the action situation while they are affected by (d) *exogenous variables* and produce (e) *outcomes*. These outcomes have, in turn, a feedback effect on the state of the exogenous variables and on participants. Finally, the performance of the system is judged by different (f) *evaluative criteria*. The IAD framework considers each of these tiers as decomposable systems that can be unpacked to include much diversity in terms of configuration, as can be seen in table 2.1 (see Ostrom, 1990; Ostrom, 2005d; Ostrom et al., 1994b for further details). The result is that even though the IAD stresses a universal set of elements, it requires addressing a unique combination of working parts in order to analyze particular situations (Ostrom et al., 1994b). Scholars familiar with the working parts used to describe a game in game theory will be unsurprised by the use of a universal taxonomy for underlying components of a situation, even though they may be surprised by the large number of components creating the context of the game (Ostrom, 2005c).

Table 2.1. Components of the universal working parts in the IAD framework.

Panel (a) Participants
Preference evaluations for actions and outcomes.
Acquisition, process, retainment, and use of knowledge and information.
Selective criteria for decision-making (maximization of expected utility, best responses, heuristics, etc.).
Individual resources (time and money available for decision-making).
Panel (b) Action situation: social space where individuals interact, exchange goods, solve or create problems.
Identification of participants.
The positions participants hold (e.g., bosses, employees, monitors, citizens, etc.)
Set of actions that participants in specific positions can take.
Outcomes that participants can potentially obtain through their actions.
Set of functions linking actions to outcomes (e.g., production functions).
The control that participants have with regard to linking functions.
Set of information available to a participant in a position in a given moment.
Costs and benefits (which serve as incentives and deterrents) assigned to actions and outcomes.
Panel (c) Exogenous variables
Institutions: Rules, norms, and shared strategies.
Horizontal classification: Position, boundary, choice, aggregation, information, payoff, and scope rules.
Vertical classification: Operational, collective choice, and constitutional rules.
Biophysical and material conditions: physically possible actions, potential outcomes, how actions are linked to outcomes, and information sets.
Attributes of the host community: values of behavior, level of common understanding, homogeneity, size, composition, and extent of inequality.
Panel (d) Evaluative criteria
Efficiency.
Fairness.
Learning capacity.
Others.

Being a framework, the function of the IAD is to provide the most general set of variables for analyzing all situations relevant to the framework. In this case, its function is to identify the elements that must be considered for institutional analysis (Ostrom, 2005c). Moreover, IAD does not limit an analyst to the use of just one theory. Depending upon the context of the decision environment, an analyst may in fact use the framework as a foundation for investigating the predictive

power of complementary or competing theories (Ostrom et al., 1994b). As already mentioned, there are several theories on which the IAD is built, and all of them are compatible with this framework. The type of questions asked determine the use of a particular theory, which results in the relevant components of the framework in that study (Ostrom, 2005c). Finally, theories are implemented through the development of particular models. Models make assumptions about a limited set of parameters and variables and derive predictions about likely outcomes (Ostrom et al., 1994b). There are multiple models that are compatible with most theories, including logic, mathematics, experimentation, and simulation (Ostrom, 2005c).

Therefore, the IAD framework is broad enough to embrace the whole tourism literature developed with regards to CPRs and voluntary initiatives, while at the same time specific enough to provide this literature with an internal consistency. Several different disciplines have addressed these issues in the tourism industry, each using their particular language and theories. Thus, it becomes difficult for scholars in a particular discipline to understand the value of findings from other disciplines and to incorporate them in their own analyses. The capacity of IAD to integrate different models and theories into a common conceptual setting (with a common language and universal working parts) makes it suitable for consolidating research on tourism CPRs and environmental voluntary initiatives.

The strengths of the IAD for analyzing CPRs and their management (from which tourism could benefit) are the lack of a normative bias, the variety of criteria upon which to evaluate institutional arrangements, a consideration of contextual conditions, a focus on institutions, and the recognition of transaction costs (Imperial, 1999b). The strength of the IAD in addressing environmental voluntary initiatives derives from its systematic theoretical focus on the influence of institutions on individual incentives within complex social-ecological systems (Rudd, 2004).

For example, by examining institutions and analyzing institutional change in the tourism industry, we can see that the emergence of this type of self-governing institution reflects a prior dissatisfaction of initiators with the outcomes they were obtaining from business-as-usual operations or from the type of interactions occurring at the destination. The IAD framework defends that when the resulting outcomes of a situation are productive for those involved, the participants may increase their commitment to maintain the structure of the situation as is. However, when participants view interactions as unfair or inappropriate or resulting in outcomes that are less valued, some will raise questions about trying to change the structure of the situation (Ostrom, 2005c). Additionally, there is considerable consensus that several attributes of a resource (the biophysical world), and of users of that resource, increase the likelihood of creating self-organizing institutions, as shown in table 2.2 (Ostrom, 2005b).

Table 2.2. Attributes of the resource and of users that increase the likelihood of self-organization.

Attributes of resource	Attributes of users
Feasible improvements of the resource.	Salience of the resource users.
Reliable and valid indicators easily available and low in cost.	Common understanding of the operation of the resource and the effects of actions of users on the resource.
Predictable flow of the resource.	Low discount rate in relation to benefits derived from the resource.
Resource system small enough as to have good information.	Trust and reciprocity among users.
	Autonomy over the resource, no external authorities.
	Prior organizational experience and leadership.

The ultimate purpose of the application of the IAD is "to recognize which combination of variables tends to lead to relatively sustainable and productive use of particular resource systems operating at specific spatial and temporal scales and which combination tends to lead to resource collapses and high costs for humanity." (Ostrom, 2007: p.15183). Its application to tourism could result in a reciprocal gain to both bodies of research through mutual reinforcement.

2.3.2. Applying "a diagnostic approach for going beyond panaceas"

As a particular application of the IAD framework for natural CPRs, Ostrom (2007) combines the IAD with a framework by Anderies et al. (Anderies, Janssen, & Ostrom, 2004) to analyze the robustness of social-ecological-systems. Since our work is focused on management of tourism's natural assets, a closer look at this recent diagnostic approach is justified.

This diagnostic approach develops a specific framework for identifying combinations of variables that affect actors' incentives in using ecological systems under diverse governance systems. Ostrom examines the nested attributes of a resource system (RS) and the resource units (RU) generated by that system that jointly affect the incentives of users (U) within a set of rules crafted by governance systems (GS) affecting interactions (I) and outcomes (O) over time. These are all affected by social, economic, and political setting (S) and by the state of related ecosystems (ECO).

These eight broad variables can be unpacked into a second-tier set of variables that have been found in empirical studies to impact diverse interactions and outcomes, as is shown in table 2.3.

Table 2.3. Second-tier variables in analyzing a social-ecological system.

Social, Economic and Political Settings (S)	
S1- Economic development S2- Demographic trends S3- Political stability S4- Government settlement policies S5- Market incentives S6- Media organization	
Resource System (RS)	Governance System (GS)
RS1- Sector (e.g. water, forests, pasture, fish)	GS1- Government organizations
RS2- Clarity of system boundaries	GS2- Non-government organizations
RS3- Size of resource system	GS3- Network structure
RS4- Human-constructed facilities	GS4- Property-rights system
RS5- Productivity of system	GS5- Operational rules
RS6- Equilibrium properties	GS6- Collective-choice rules
RS7- Predictability of system dynamics	GS7- Constitutional rules
RS8- Storage characteristics	GS8- Monitoring & sanctioning processes
RS 9- Location	
Resource Units (RU)	Users (U)
RU1- Resource unit mobility	U1- Number of users
RU2- Growth or replacement rate	U2- Socioeconomic attributes of users
RU3- Interaction among resource units	U3- History of use
RU4- Economic value	U4- Location
RU5- Size	U5- Leadership/entrepreneurship
RU6- Distinctive markings	U6- Norms/social capital
RU7- Spatial & temporal distribution	U7- Knowledge of social-ecological system/mental modes
	U8- Dependence on resource
	U9- Technology used
Interactions (I)	Outcomes (O)
I1- Harvesting levels of diverse users	O1- Social performance measures (e.g., efficiency, equity, accountability)
I2- Information sharing among users	O2- Ecological performance measures (e.g., overharvested, resilience, diversity)
I3- Deliberation processes	O3- Externalities to other social-ecological systems
I4- Conflicts among users	
I5- Investment activities	
I6- Lobbying activities	
Related Ecosystems (ECO)	
ECO1- Climate patterns. ECO2- Pollution patterns. ECO3- Flows into and out of focal social-ecological system	

Source: Ostrom (2007)

The second-tier variables are considered the initial core conceptual variables necessary to identify the type of social-ecological system operating at a particular location, as well as the reasons for sustainable or unsustainable outcomes. These second-tier variables include, among others, 30 variables identified by Agrawall (2001) as critical factors in the organization, adaptability, and sustainability of common property. Given the large number of relevant variables, Agrawall raises challenging questions about the real capacity of research to address so many variables in any single study. Ostrom (2007) alleges that since social-ecological systems are partially decomposable, not all these variables are relevant for every study.

Hardin's restricted view of CPRs

Here we include the analysis by Ostrom (2007) on conditions leading to the tragedy of the commons in order to compare this baseline with the next section's findings from an application to tourism. Ostrom (2007) reconstructs Hardin's (1968) view of CPRs to identity the particular set of second-tier variables defining the emergence of tragedy outcomes.

Table 2.4. Second-tier variables used by Hardin (1968) in the tragedy of the commons.

Social, Economic and Political Settings (S)	
S5- Market incentives.	
Resource System (RS)	Governance System (GS)
RS1- Pasture RS3- Finite size RS5- Renewable resource	
Resource Units (RU)	Users (U)
RU1- Mobile animals on stationary grasses RU4- Fatted cattle can be sold for cash RU6- Distinctive markings	U1- Large number of users U7- Maximization of short-term gains
Interactions (I)	Outcomes (O)
I1- Maximum harvesting levels by users	O2- Destruction of ecological systems
Related Ecosystems (ECO)	

Source: Ostrom (2007)

Hardin defines the resource system as a pasture (RS1) where animals graze, which can be defined as mobile individual resource units (RU1). Each animal can be identified by its owner (RU6) and can be sold for cash (RU4). In addition, Hardin presents a situation in which the number of users is large (U1) with respect to

the size of the pasture (RS3) such that users are adversely affecting the pasture's long-term productivity (RS5). In this pasture, no governance system is present to regulate usage (i.e., there are no GS variables) and users independently make decisions to maximize their own short-term return (U7). These assumptions lead to the theoretical prediction of high pasture harvesting (I1) and severe degradation or destruction of the ecological system (O2).

The conclusion extracted by Ostrom (2007) is that Hardin's tragedy of the commons is based on an extremely particular view of the commons. As can be seen by comparing table 2.3 and table 2.4, the range of possible variables characterizing a social-ecological system is much more diverse than the particular setting presented by Hardin.

Voluntary initiatives in nature-based tourism destinations

Let us now undertake a comparable analysis to that in Hardin's (1968) allegory, as developed by Ostrom (2007), of tourism industry's voluntary environmental initiatives and, specifically, those at nature-based tourism destinations. Our interest in this section is to show how the diagnostic approach presented in table 2.3 can be applied to understand how combinations of variables affect the incentives and actions of tourism users under diverse governance systems. More precisely, we use the diagnosis approach for structuring empirical evidence contained in the publication by the World Tourism Organization (WTO, 2002) on voluntary initiatives for sustainable tourism and in the United Nations Environment Programme publication (UNEP, 1998) on ecolabels in the tourism industry. The UNEP undertakes primary research on 28 ecolabels developed for the tourism industry, whereas the WTO addresses over one hundred cases of voluntary initiatives (including not only ecolabels but also awards and unilateral commitments). The main findings of these reports are that regularities that can be extracted from successful voluntary initiatives in their samples. Both the UNEP (1998) and the WTO (2002) consider successful cases to be those where the voluntary initiative is created and survives through time[7]. As a result of organizing this empirical information under the diagnostic approach, we see that the stylized facts of settings where tourism's voluntary initiatives have been successful broadly coincide with the attributes of the resource, and of users, which increases the likelihood of self-organization (Ostrom, 2005b) as presented in table 2.2. These changes are mostly changes in the governance system (GS), but also comprise changes in other components of the social-ecological system (UNEP, 1998; WTO, 2002).

Since the diagnostic approach is designed for the analysis of social-ecological systems, we concentrate on nature-based tourism destinations. Nature-based desti-

[7] However, it must be noted that evaluating a voluntary program on the basis of participation alone is not the most appropriate alternative. Even with very high participation rates, aggregate abatement can be very low if abatement by each participating firm is low (Alberini et al., 2002).

nations are defined as those that rely strongly on certain ecological and scenery systems, the quality of which represent the major pull factor for the destinations' associated demand (S5, RU4) (Alegre et al., 2006b; Alegre & Pou, 2003; Huybers et al., 2002c, 2003). These destinations tend to be located in fragile natural environments that rapidly degrade upon un-responsible environmental management (RS6).

First, the WTO (2002) shows that successful voluntary initiatives are those whose objectives and goals are clearly identified. This requires a precondition of participants sharing a common understanding (U6) regarding awareness and acceptance of environmental issues and their capacity for action. This is easier to achieve when the resource system is salient to users (U8), i.e., when profits to firms depend on environmental quality. This is one of the reasons that voluntary initiatives are more likely to be implemented in developed countries (RS9) (WTO, 2002). In developed countries, tourism has greater relevance to the economic sector and is subject to greater levels of competition (S5). In addition, environmental awareness by consumers and suppliers is stronger (S5), and therefore the potential benefits of participating in voluntary initiatives are greater.

In addition, a second characteristic of successful voluntary initiatives, according to WTO (2002), is the existence of trust and respect among participants (U6). It is necessary for an initial level of social capital among participants to be in place, as well as trust building activities over the course of the initiative's development (WTO, 2002). In addition, a wider precondition related to social capital is the existence of political stability. It is widely accepted that tourists are highly sensitive to political instability, and this is a potential factor deterring the further development of a destination (Dhariwal, 2005; Drakos & Kutan, 2003; Greenbaum & Hultquist, 2006; Issa & Altinay, 2006; Kousis, 2000; Pizam & Smith, 2000).

According to the WTO (2002) and the UNEP (1998), when these preconditions are in place, a success factor for developing a voluntary sustainability initiative is the existence of highly recognized leadership with a strong personality or organization (U5). Other user factors related to success are the existence and adequate use of prior experience (U3) and the target group producing a comparable tourism product (U2). Also relevant is that the target group is capable of achieving significant improvements to the resource (O2). In this regard, two conditions are simultaneously necessary: on the one hand, that the ecological system is renewable (RS5), and on the other hand, that environmental requirements to enter the voluntary initiative are sufficiently stringent (GS5.b).

Another trait of successful initiatives, according to both the WTO (2002) and the UNEP (1998), is that entrance has to be conditioned on applicants meeting certain requirements, which should be proactive and entail environmental improvements significantly greater than legal compliance (GS5.b). This minimum threshold criterion is selected not only to guarantee that relevant environmental improvements are achieved with regards to main problems, but also that members can improve their image. However, there should be a balance between the effec-

tiveness criteria and its realistic capacity of being implemented. Responses from surveys to the UNEP (1998) show that hard-to-meet criteria narrow the number of potential participants.

Entrance criteria constitute a type of boundary rule, since they specify who is eligible to enter a position and the process of determining which eligible participant may enter and leave. Not all criteria must be equally relevant for defining initiative acceptance (UNEP, 1998). Implementation can be compulsory, delayed compulsory (with some extra time applied), or optional. The latter case is relevant insofar as it sends a message to participants that further actions can be implemented, and specifies the direction of these activities. Other boundary rules identified by the WTO (2002) and UNEP (1998) are fees to enter, services included in fee payments, how long a partner must remain a member of the initiative, and the terms of use for a logo (GS5.b). All these rules must be public, clear, and transparent (GS5.d). To get enough applicants, the target group has to have easy access to the application process and be able to easily make first steps (GS5.b). In addition, fees must be affordable and compatible with the value obtained by participants (GS5.b).

Boundary rules must be revised in order to maintain the voluntary initiative in accordance with technological change and variations in the importance of environmental problems. Consequently, aggregation rules specifying the mechanisms of change in requirements are necessary (GS5.c). Aggregation rules define whether a decision can be undertaken by a single agent or whether multiple participants are necessary prior to an action (Ostrom, 2005a).

In addition, the validity of boundary rules relies on the existence of mechanisms for deciding if participants comply with requirements. This includes verification of the information provided by the applicant and evaluation of whether this supports acceptance into the voluntary initiative. If verification is to be undertaken, it requires a determination of the verification body responsible for providing written assurance of conformance with specified requirements (Font, 2002) (GS5.a). Monitoring and assessment of the initiative's evolution are also accorded high relevance (GS8) (UNEP, 1998; WTO, 2002). Therefore, position rules are required for who has the responsibility to develop these tasks (GS.a). Verification, evaluation, and other monitoring activities can be different in different situations. For example, verification can be undertaken by the operator of the scheme or by third parties; evaluation can be based either on quantitative or qualitative terms; and monitoring can be announced or not announced, regularly or irregularly (UNEP, 1998). In addition, monitoring may address the number of applicants, number of members, members' degree of compliance with entrance requirements, the environmental results of the initiative, and factors related to successes and difficulties (WTO, 2002). In any case the objective is to obtain information on the state of the initiative to which a partner belongs. Thus, information rules are required to define the treatment given to this information (GS5.d).

Information rules determine which information is available to participants about the structure of the situation, state variables, and the behavior of other par-

ticipants (Ostrom, 2005a). The type of information rules in place can facilitate the development of trust and consensus on objectives and goals (reinforce U6). These can strengthen the sense of group membership (U6) and permit firms to share knowhow related to the initiative's objectives (I2) (WTO, 2002). Then, the structure of communication channels for sharing information among users must be seriously considered (GS5.d). Within information management, the UNEP (1998) publication gives high relevance to technical assistance. Technical assistance is given high priority because many entrepreneurs, especially small and medium-sized firms, find it difficult to identify environmental problems and solutions. Thus, the level of technical assistance should be related to the type and stringency of criteria, and several mechanisms for providing these criteria to applicants should be used, such as initial checklists, reliance on process-driven criteria, and site-visits during verification processes.

Finally, for a voluntary initiative to be successful, it is necessary that firms obtain a reward from joining. These rewards might result either from market forces or payoff rules. The literature review in section 2.2.1, extended in Blanco et al. (2009), supports the notion that at least a certain proportion of tourism firms obtain higher economic results from undertaking voluntary environmental initiatives (O1). Thus, environmental attributes are valued by a certain share of the demand market (S5). In general, it is assumed that a voluntary tourism initiative is important for its members when it provides them a positive image and reputation (UNEP, 1998; WTO, 2002) (GS5.e). The strength of voluntary initiatives is to provide high quality information to external parties. Consequently, marketing activities related to the environmental performance of members' voluntary initiatives constitute a basic success factor (GS5.e) (Font, 2002; Mihalic, 2000; UNEP, 1998; WTO, 2002). The use of a logo or the like is insufficient to move the demand market, and additional promotion and marketing is necessary (UNEP, 1998). There must be a strong marketing concept reaching the target group (obtain applicants), consumers (generate image and reputation), and other stakeholders. The most widely used marketing mechanisms are press and media coverage, publication directories, and online marketing.

In addition, it may be the case that certain payoff rules defining external rewards or sanctions for particular actions or outcomes are in place. For example, some successful voluntary initiatives establish immediate services offered to firms who become members (e.g., a phone hotline or individual consultancy) (GS5.e).

Regarding interactions and outcomes, the WTO (2002) and UNEP (1998) conclude that all voluntary initiatives in their study have some positive effects on awareness raising, acceptance of environmental issues, learning, co-operation, product improvement, and moving the market (O1). The WTO (2002), however, further notes that the quantity of participants in voluntary initiatives does not yet give a real choice to consumers worldwide (O1). Despite this, most voluntary initiatives have had excellent success in becoming agents of standards and guarantees of quality to consumers (O1). Voluntary initiatives have proven successful when participants confirm the benefits they obtained (I2), including saving money,

gaining knowhow, enhancing image and quality, increasing demand, and developing a sense of group membership and cooperation with other members. Lastly, voluntary initiatives that include public and private partners and that work to align different interests (GS1) seem to be more successful than others (UNEP, 1998; WTO, 2002). These have a higher level of transparency, along with improved requirements and recognition (O1). Nearly 50 percent of the voluntary initiatives analyzed by the WTO (2002) are led by or strongly cooperate with government organizations and NGOs (GS2).

Major difficulties to the success of voluntary initiatives include financial problems, declining interest, and lack of impressive successes. An adequate funding structure, according to the WTO (2002), entails public programs (GS1) or private foundations (GS3) financing initial research creating the initiatives, development, and implementation. The organization of the voluntary initiative and its partners must cover the general operation and marketing efforts, to which sponsorship might be valuable as long as it does not compromise the independence of the initiative. Finally, fees from members cover (part of) the direct costs for application and verifying compliance with requirements (GS5.d).

In addition, to complete the diagnostic approach it is necessary to incorporate some of the well known specificities of the tourism industry. First, services are time-perishable, which means they can not be stored, e.g., an empty seat on a flight cannot be stored for the next flight, and is therefore lost (Foster, Sampson, & Dunn, 2000). Thus, CPRs that are a component of the tourism product (e.g., landscape, forestland, beaches) can not be stored (RS8). Second, tourism is heterogeneous in terms of types of firms, all of which require their own infrastructure (RS4) (Foster et al., 2000; Orfila-Sintes, Crespí-Cladera, & Martínez-Ros, 2005). In addition, voluntary initiatives have been developed by different types of firms. These include accommodation, restaurants, sports and leisure, attractions, and transportation (WTO, 2002). Third, the existence of tour operators as intermediaries between demand and supply conditions market factors and competition (S5) (Calveras et al., 2005). Fourth, tourism demand is variable and volatile (S5). Users' demand for CPRs in the tourism industry is subject to intra- and inter-annual changes (Briassoulis, 2002). Tourism demand is often seasonal due to intra-annual changes in meteorological conditions (e.g., sunny weather is preferred for beach destinations while low temperatures and precipitation are preferred for ski areas) (ECO1). In addition, tourists are highly sensitive to negative shocks affecting tourism destinations. This includes political instability (e.g., terrorism) (Dhariwal, 2005; Drakos et al., 2003; Greenbaum et al., 2006; Issa et al., 2006; Pizam et al., 2000) (S3), pollution events (e.g., spills, sanitary conditions) (Anaman & Looi, 2000; Böhm & Pfister, 2008; Garza-Gil, Prada-Blanco, & Vázquez-Rodríguez, 2006; Stonich, 1998) (ECO2) and adverse climate episodes (e.g., tsunamis, climate change) (Hall, 2006; Velarde, Malhi, Moran, Wright, & Hussain, 2005) (ECO1). Lastly, tourism generates soft individual environmental pressures comparable to pressures induced by residents, though aggregate pressures might still be substantial (I1) (Sasidharan et al., 2002). Since residents and tourists share the

same ecological system and develop quite similar uses of it, tourism operation may yield negative externalities to residents because of their appropriation of natural resources (O3), even after undertaking environmental initiatives.

Table 2.5. Second-tier variables of successful voluntary initiatives in nature-based tourism destinations.

Social, Economic and Political Settings (S)	
S3- Political stability. S5- Variable and volatile demand, tour operators as intermediaries, Strong market competition, Environmental awareness by consumers and suppliers.	
Resource System (RS)	Governance System (GS)
RS4- Tourism industry: accommodation, restaurants, sports and leisure, attractions, transport	GS1- Public-private initiatives, Government finance contributions
RS5- Feasible improvements to the resource	GS2- NGOs organizing voluntary initiatives
RS8- Perishable (no storage)	GS3- Private foundations finance contributions
	GS5.a- Position rules: responsibilities of members, verification body, evaluation body, monitoring
	GS5.b- Boundary rules: who can partner, stringent and proactive environmental requirements (substantially above regulation) to enter, which must be realistic, fees, services from fees, time commitment, terms of use logo, easy initial steps
	GS5.c- Aggregation rules: update in requirements to enter
	GS5.d- Information rules: state of the voluntary initiative, communication channels among members, technical assistance, public, clear and transparent governance system
	GS5.e- Payoff rules: Image and reputation, marketing, services
RS9- Mainly in developed countries	GS8- Diverse monitoring and sanctioning processes
Resource Units (RU)	Users (U)
RU4- High economic value for tourism uses	U2- Voluntary initiatives addressing firms with a comparable tourism product.
	Heterogeneous firms.
RU6- Fragile ecological system	U3- Adequate use of prior experience
	U5- Leadership
	U6- Common understanding of objectives and goals of voluntary initiatives.
	Trust and respect.
	Sense of group membership
	U7- Knowledge of available voluntary programs

	U8- Salience of natural resources to users
Interactions (I)	Outcomes (O)
I1- Soft individual pressures and severe aggregate pressures.	O1- Awareness raising, acceptance of environmental issues, learning, co-operation, product improvement, market response, quality guarantee, limited number of participants
	Higher levels of transparency, requirements and recognition for public-private initiatives
I2- Know how sharing, confirmation of benefits obtained	O2- Significant improvements in resource conditions.
	O3- Negative appropriation externalities
Related Ecosystems (ECO)	
ECO1- Strong influence of climate patterns on demand. ECO2- Strong sensitivity of demand to pollution.	

As can be seen in table 2.5, some of the attributes characterizing successful voluntary initiatives at nature-based tourism destinations resemble those attributes of users and resources which, according to Ostrom (2005b), increase the likelihood that self-governing associations will arise (see table 2.2). In addition, the development of voluntary initiatives in the tourism industry conforms to previous findings from institutional approaches to social-ecological systems. These findings show that when users of a resource design their own rules, which are enforced by local users (or when users are accountable to them), and effectively assign costs proportionate to benefits, collective action and monitoring problems are solved in a reinforcing manner (Ostrom, 1990).

Moreover, by comparing table 2.5 to table 2.4 it can be seen that successful voluntary environmental initiatives in nature-based tourism destinations constitute a much more complex social-ecological system than the tragedy of the commons theory described by Hardin (1968). Thus, the application of Hardin's point of view on the use of panacea solution to CPR situations in the tourism industry is strongly misleading. Applying the IAD framework represents one way in which the tourism literature could benefit from prior knowledge on how agents make decisions under different institutional designs. Surely, it is not the only way in which the literature on CPRs and voluntary environmental initiatives in the tourism industry could advance, but we believe it is relevant enough to be seriously considered for future research in the area.

2.4. Conclusion

The tourism industry is a rapidly changing industry competing in a dynamic international context. Within this industry, environmental factors are of major importance. Therefore, it is to the benefit of tourism destinations to have sound institutions for the managing of natural resources. Institutional prescriptions offered by the tourism literature are widely rooted either in the tragedy of the commons (Hardin, 1968) or lifecycle model (Butler, 1980). Both theories predict that natural resources will be overused if there is no external intervention governing the behavior of users.

While it is true that there are examples of tourism destinations that have overexploited their CPRs, thereby losing their appeal and stagnating, it is also true that individual agents and groups in other destinations have developed voluntary environmental initiatives that have overturned free-riding expectations. In this chapter, we reviewed the literature on CPRs and voluntary initiatives in tourism, showing that CPR situations have been described as social dilemmas and that these dilemmas have been alleviated in some circumstances by means of voluntary environmental initiatives. We also reviewed the literature on the incentives for tourism stakeholders to undertake voluntary environmental initiatives, which include unilateral commitments, negotiated agreements, and certified environmental practices. As a result, we argue that there are monetary and non-monetary incentives for stakeholders to develop voluntary environmental initiatives. Further, we presented several limitations of this literature that might be (partially) overcome by applying the IAD framework to tourism research on voluntary environmental initiatives.

The IAD is a framework designed to provide a conceptual approach to integrating research from various disciplines on the analysis of interrelationships between institutions and incentives for individuals' behavior. Under this framework, institutions are understood as enduring regularities of human action. Institutions determine opportunities and constraints of action, available information, and benefits to be obtained from a situation, among other factors. This wide definition comprises a wide spectrum of institutions, ranging from churches to markets, and including voluntary initiatives.

Operationally, the IAD develops a common language for research and conceptualizes all situations as being composed of the same set of elements. These elements include participants, action situations, patterns of interaction, several exogenous variables, outcomes to be obtained, and evaluative criteria. Several theories are compatible with the IAD framework. The research question to be addressed in each study is what will determine the theory that will be applied, which will consequently define the components of the framework considered in that case. Our argument is that the IAD can consolidate research on tourism's voluntary initiatives and bring it closer to the mainstream literature. As a result, the tourism literature could benefit from prior knowledge on how agents make decisions under

different institutional designs in non-tourism settings, and the mainstream literature could expand its scope. Applying the IAD is not the only line of research that can advance the CPR and voluntary environmental initiative tourism literature, but it is a relevant alternative.

Further, we presented a particular way of using the IAD for social-ecological systems, namely, the "diagnostic approach for going beyond panaceas," recently developed by Ostrom (2007). We applied this diagnostic approach to the analysis of voluntary environmental initiatives at nature-based tourism destinations. Building on the stylized facts presented in the comparative case-studies of the WTO (2002) and UNEP (1998), our results show that voluntary initiatives at nature-based tourism destinations are a much more complex social-ecological systems than Hardin's (1968) tragedy of the commons, as presented by Ostrom (2007). Thus, the use of Hardin's viewpoint of panacea solutions should be revised. Further, our results have identified some of users' and resources' attributes in tourism that, according to previous research (Ostrom, 2005b), increase the likelihood that self-governing associations' emergence.

Thus, the central argument of this chapter is that the universe of institutions capable of alleviating social dilemmas in managing natural resources at tourism destinations is larger than simply those imposed by public administrations. A wide range of instruments can be used to foster tourism sustainability, most of which can be complementarily applied. For example, regulations can be used to define the legal framework for establishing minimum standards, and voluntary initiatives can complement these by fostering environmental improvements beyond the scope of the regulations (UNEP, 1998).

The prominence of voluntary initiatives reflects a change in governance (as a whole) in many western countries, where the central government is no longer supreme (Bramwell et al., 2000; Marshall, 2005). In the polycentric state, the function of the government is to encourage arrangements for coping with problems and to distribute services amongst relevant stakeholders (Marshall, 2005). In this governance context, stakeholders should be provided with more information about the CPR situation and the institutions that are in place. The disparity between expected free-riding behavior and the actual characteristics of agents to which environmental policy is addressed might produce unpredicted results. Researchers and practitioners should consider a wider set of social-ecological system attributes in order to understand the effects of institutions on the behavior of tourism stakeholders.

Many research questions remain unaddressed regarding the influence of alternative institutional designs on tourism's sustainability. What are the strategic incentives of tourism stakeholders? How can government intervention change strategic incentives for undertaking abatement activities? Can different types of voluntary initiatives coexist in the long run? These are only some of the questions to be addressed within a wider research agenda in order to understand how to alleviate social dilemmas for managing natural resources at tourism destinations.

2.5. References

Agrawal, A. (2001). Common property institutions and sustainable governance of resources. *World Development*, 29, 1649-1672.

Alberini, A., & Segerson, K. (2002). Assessing voluntary programs to improve environmental quality. *Environment & Resource Economics*, 22, 157-184.

Albrech, J. (1998). *Environmental regulation, comparative advantage and the Porter Hypothesis* (Vol. 59): Fondazione Eni Enrico Mattei.

Alegre, J., & Cladera, M. (2006a). Repeat visitation in mature sun and sand holiday destinations. *Journal of Travel Research*, 44, 288-297.

Alegre, J., & Juaneda, C. (2006b). Destination loyalty: Consumers' economic behavior. *Annals of Tourism Research*, 33, 648-706.

Alegre, J., & Pou, L. (2003). El turismo de sol y playa desde la perspectiva de los consumidores Europeos. Un nuevo desafío en el desarrollo turístico de Baleares. In *Serie Estudios Regionales Islas Baleares* (pp. 149-176): Servicio de Estudios BBVA.

Álvarez, M., Burgos, J., & Céspedes, J. (2001). An analysis of environmental management, organizational context and performance of Spanish hotels. *Omega*, 29, 457-471.

Amacher, G., Koskela, E., & Ollikainen, M. (2004). Environmental quality competition and ecolabeling. *Journal of Environmental Economics and Management*, 47, 284-306.

Anaman, K., & Looi, C. (2000). Economic impact of haze-related air pollution on the tourism industry in Brunei Darussalam. *Economic Analysis and Policy*, 30, 133-143.

Anderies, J. M., Janssen, M., & Ostrom, E. (2004). A framework to analyze the robustness of social-ecological systems from an institutional perspective. *Ecology and Society*, 9 (1), 18.

Anton, W., Deltas, G., & Khanna, M. (2004). Incentives for environmental self-regulation and implications for environmental performance. *Journal of Environmental Economics and Management*, 48, 632-654.

Baland, J.-M., & Platteau, J.-P. (1996). *Halting degradation of natural resources: Is there a role for rural communities?* Oxford: Clarendon Press.

Becker, G. S. (1983). A theory of competition among pressure groups for political influence. *Quarterly Journal of Economics*, 98, 371-400.

Blanco, E., Rey-Maquieira, J., & Lozano, J. (2009). Economic Incentives for Tourism Firms to Undertake Voluntary Environmental Management. *Tourism Management*, 30, 112-122.

Böhm, G., & Pfister, H.-R. (2008). Anticipated and experienced emotions in environmental risk perception. *Judgment and Decision Making*, 3, 73-86.

Bramwell, B., & Lane, B. (2000). Collaborations and partnerships in tourism planning. In B. Bramwell, & B. Lane (Eds.), *Tourism collaborations and partnerships: Politics, practice and sustainability* (pp. 1-19). Clevedon: Channel View Publications.

Bramwell, B., & sharma, A. (1999). Collaboration in local tourism policymaking. *Annals of Tourism Research*, 26, 392-415.

Brau, R., & Carraro, C. (2004). *The economic analysis of voluntary approaches to environmental protection. A survey*, Working papers: Centro Ricerche economiche nord sud. Università di Cagliari, Università di Sassari.

Brennan, G., & Buchanan, J. M. (1980). *The power to tax: Analytical foundations of a fiscal constitution*. Cambridge: Cambridge University Press.

Briassoulis, H. (2002). Sustainable tourism and the question of the commons. *Annals of Tourism Research*, 29, 1065-1085.

Brohman, J. (1996). New directions in tourism for third world development. *Annals of Tourism Research*, 23, 48-70.

Brunstad, R. J., Gaasland, I., & Vardal, E. (1999). Agricultural production and the optimal level of landscape preservation. *Land Economics*, 75, 538-546.

Buckley, R. (1992). New United States Federal Trade Commission Guidelines for Ecolabelling and Green Advertising. *Environmental and Planning Law Journal*, 9, 479.

Buckley, R. (2002). Tourism ecolabels. *Annals of Tourism Research*, 29, 183-208.

Bujosa, A., & Rosselló, J. (2007). Modeling environmental attitudes toward tourism. *Tourism Management*, 28, 688-695.
Butler, R. (1980). The concept of a tourist area cycle of evolution: implications for management of resources. *Canadian Geographer*, 24, 5-12.
Calveras, A., & Vera-Hernández, M. (2005). Quality externalities among hotel establishments: what is the impact of tour operators? *Tourism Economics*, 11, 571-593.
Canan, P., & Hannessy, M. (1989). The growth machine, tourism and the selling of culture. *Sociological Perspectives*, 32, 227-243.
Candela, G., & Cellini, R. (2006). Investment in tourism market: a dynamic model of differentiated oligopoly. *Environmental and Resource Economics*, 35, 41-58.
Cardenas, J., & Ostrom, E. (2004). What do people bring into the game? Experiments in the field about cooperation in the commons. *Agricultural Systems*, 82, 307-326.
Carmona-Moreno, E., Céspedes-Lorente, J., & de Burgos-Jimenez, J. (2004). Environmental strategies in Spanish Hotels: Contextual factors and performance. *The Service Industries Journal*, 24, 101-130.
Cashore, B., & Vertinsky, I. (2000). Policy networks and firm behaviors: Governance systems and firms reponses to external demands for sustainable forest management. *Policy Sciences*, 33, 1-20.
Crawford, S. E. S., & Ostrom, E. (1995). A grammar of institutions. *The American Political Science Review*, 89, 582-600.
Dawson, N. L., & Segerson, K. (2008). Voluntary agreements with industries: Participation incentives with industry-wide targets. *Land Economics*, 84, 97-114.
Deci, E. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18, 105-115.
Delmas, M., & Keller, A. (2005). Free riding in voluntary environmental programs: The case of the U.S. EPA WasteWise program. *Policy Sciences*, 38, 91-106.
Dewhurst, H., & Thomas, R. (2003). Encouraging sustainable business practices in a non-regulatory environment: A case study of small tourism firms in a UK national park. *Journal of Sustainable Tourism*, 11, 383-403.
Dhariwal, R. (2005). Tourist arrivals in India: How important are domestic disorders? *Tourism Economics*, 11, 185-205.
Dodds, R., & Joppe, M. (2005). *CSR in the tourism industry? The status of and potential for certification, codes of conduct and guidelines*. I. C. Department, International Finance Corporation, World Bank Group.
Drake, L. (1999). The Swedish agricultural landscape- economic characteristics, valuations and policy options. *International Journal of Social Economics*, 26, 1042-1060.
Drakos, K., & Kutan, A. (2003). Regional effects of terrorism on tourism in three Mediterranean countries. *Journal of Conflict Resolution*, 47, 621-641.
Duffy, R. (2000). Shadow players: ecotourism development, corruption and state politics in Belize. *Third World Quarterly*, 21, 549-560.
Edgell, D. L. (2002). *Best practices guidebook for international tourism development for rural communities*. Provo, Utah: Bringham Young University.
Faria, J. R. (2008). Demographic and technological growth in the tourism market. *Tourism Economics*, 14, 115-122.
Font, X. (2002). Environmental certification in tourism and hospitality: progress, process and prospects. *Tourism Management*, 23, 197-205.
Foster, T. S. J., Sampson, S. E., & Dunn, S. C. (2000). The impact of customer contact on environmental initiatives for service firms. *International Journal of Operations & Production Management*, 20, 197-203.
Garza-Gil, M. D., Prada-Blanco, A., & Vázquez-Rodríguez, M. X. (2006). Estimating the short-term economic damages from the *Prestige* oil spill in the Galician fisheries and tourism. *Ecological Economics*, 58, 842-849.

Goeldner, C. R., & Ritchie, J. R. B. (2003). *Tourism: principles, practices, philosophies* (10th ed.). New Jersey: John Wiley & Sons, Inc.

Gómez, C., Lozano, J., & Rey-Maquieira, J. (2008). Environmental policy and long-term welfare in a tourism economy. *Spanish Economic Review*, 10, 41-62.

González, M., León, C., & Padrón, N. (2006). Obsolescencia y políticas de renovación medioambiental en el sector turístico. *Cuadernos Económicos del ICE*, 71, 153-176.

Gray, B. (1989). *Collaborating: Finding common ground for multiparty problems*. San Francisco: Jossey-Bass Publishers.

Green, H., Hunter, C., & Moore, B. (1990). Assessing the environmental impact of tourism development. Use of the Delphi technique. *Tourism Management*, 11, 111-120.

Greenbaum, R., & Hultquist, A. (2006). The economic impact of terrorist incidents on the Italian hospitality industry. *Urban Affairs Review*, 42, 113-130.

Hall, M. (2006). New Zealand tourism entrepreneur attitudes and behaviors with respect to climate change adaptation and mitigation. *International Journal of Innovation and Sustainable Development*, 1, 229-237.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 163, 1243-1248.

Hardin, G. (1998). Extensions of "The Tragedy of the Commons". *Science*, 280 (5364), 682-683.

Hassan, S. H. (2000). Determinants of market competitiveness in an environmentally sustainable tourism industry. *Journal of Travel Research*, 38, 239-245.

Healy, R. (1994). The "common pool" problem in tourism landscapes. *Annals of Tourism Research*, 21, 596-611.

Hjalager, A. (1996). Tourism and the environment: The innovation connection. *Journal of Sustainable Tourism*, 4, 201-218.

Hudson, S., Ritchie, B., & Seldjan, T. (2004). Measuring destination competitiveness: An empirical study of Canadian ski resorts. *Tourism and Hospitality Planning & Development*, 1, 79-94.

Huybers, T., & Bennett, F. (2002a). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2002b). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2002c). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2003). Environmental management and the competitiveness of nature-based tourism destinations. *Environmental and Resource Economics*, 24, 213-233.

Imperial, M. (1999a). Analyzing institutional arrangements for ecosystem-based management: Lessons from the Rhode Island Salt Ponds SAM Plan. *Coastal Management*, 27, 31-56.

Imperial, M. (1999b). Institutional analysis and ecosystem-based management: The institutional analysis and development framework. *Environmental Management*, 24, 449-465.

Issa, I. A., & Altinay, L. (2006). Impacts of political instability on tourism planning and development: The case of Lebanon. *Tourism Economics*, 12, 361-381.

Jamal, T., & Getz, D. (1995). Collaboration theory and community tourism planning. *Annals of Tourism Research*, 22, 186-204.

Joppe, M. (1996). Sustainable community tourism development revisited. *Tourism Management*, 17, 475-479.

Kassinis, G., & Soteriou, A. (2005). Greening service organizations: environmental management practices and performance. In S. Sharma, & J. Aragón (Eds.), *Corporate environmental strategy and competitive advantage* (pp. 115-138). Cheltenham: Edward Elgar.

Khanna, M. (2001). Non-mandatory approaches to environmental protection. *Journal of Economic Surveys*, 15, 291-324.

Knowles, T., & Curtis, S. (1999). The market viability of European mass tourist destinations. A post-stagnation life-cycle analysis. *International Journal of Tourism Research*, 1, 87-96.

Kousis, M. (2000). Tourism and the environment: A social movement perspective. *Annals of Tourism Research*, 27, 468-489.

Kusluvan, S., & Karamustafa, K. (2001). Multinational hotel development in developing countries: an Exploratory analysis of critical policy issues. *International Journal of Tourism Research*, 3, 179-197.

Kuvan, Y., & Akan, P. (2005). Residents' attitudes toward general and forest-related impacts of tourism: The case of Belek, Antaya. *Tourism Management*, 26, 691-706.

Laffont, J. J., & Martimort, D. (1999). Collusion and delegation. *Rand Journal of Economics*, 30, 232-262.

Liu, J., Sheldon, P. J., & Var, T. (1987). Resident perceptions of the environmental impacts of tourism. *Annals of Tourism Research*, 14, 17-37.

Lopez, R. A., Shah, F. A., & Altobello, M. A. (1994). Amenity benefits and the optimal allocation of land. *Land Economics*, 70, 53-62.

Lyon, T., & Maxwell, J. (2002). "Voluntary" approaches to environmental regulation. In M. Franzini, & A. Nicita (Eds.), *Economics Institutions and Environmental Policy* (pp. 75-120). Brookfield, Vermont: Ashgate Publishing.

Lyon, T., & Maxwell, J. (2008). Corporate social responsibility and the environment: A theoretical perspective. *Review of Environmental Economics and Policy*, 2, 240-260.

Madrigal, R. (1995). Residents' perceptions and the role of government. *Annals of Tourism Research*, 22, 86-102.

Marshall, G. R. (2005). *Economics for collaborative environmental management: Renegotiating the commons*. Sterling: Earthscan.

Mihalic, T. (2000). Environmental management of a tourist destination. A factor of tourism competitiveness. *Tourism Management*, 21, 65-78.

Morgan, M. (1991). Dressing up to survive: Marketing Majorca anew. *Tourism Management*, 12, 15-20.

Orfila-Sintes, F., Crespí-Cladera, R., & Martínez-Ros, E. (2005). Innovation activity in the hotel industry: Evidence from Balearic Islands. *Tourism Management*, 26, 851-865.

Osés, N., & Viladrich, M. (2007). On the sustainability of common property resources. *Journal of Environmental Economics and Management*, 53, 393-410.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action* (17th ed.). New York: Cambridge University Press.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives*, 14 (3), 137-158.

Ostrom, E. (2005a). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E. (2005b). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E. (2005c). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E. (2005d). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. *PNAS*, 104, 15181-15187.

Ostrom, E., Burger, J., Field, C., Norgaard, R., & Policansky, D. (1999). Revisiting the commons: local lessons, global challenges. *Science*, 284, 278-282.

Ostrom, E., Gardner, R., & Walker, J. (1994a). *Rules, games and common pool resources* (7th ed.). Ann Arbor: University of Michigan Press.

Ostrom, E., Gardner, R., & Walker, J. (1994b). *Rules, games and common pool resources* (7th ed.): The University of Michigan Press.

Palmer, K., Oates, W. E., & Portney, P. R. (1995). Tightening environmental standards: The benefit-cost or the no-cost paradigm? *Journal of Economic Perspectives*, 9, 119-132.

Parker, S. (1999). Collaboration on tourism policy making: Environmental and commercial sustainability on Bonaire, NA. *Journal of Sustainable Tourism*, 7, 240- 259.

PATA. (2007). *Asia Travel Intentions Survey. April 2007*. Pacific Asian Travel Association.

Persson, T., & Tabellini, G. (2000). *Political Economics: Explaining Economic Policy*. Cambridge, Massachusetts: The MIT Press.
Peters, G., & Pierre, J. (2006). *Handbook of public policy*. London: Sage Publications.
Pintassilgo, P., & Albino, J. (2007). "Tragedy of the commons" in the tourism accommodation industry. *Tourism Economics*, 13, 209-224.
Pizam, A., & Smith, G. (2000). Tourism and terrorism: A quantitative analysis of major terrorist acts and their impact on tourism destinations. *Tourism Economics*, 6, 123-138.
Porter, M. E., & Van der Linde, C. (1995a). Green and competitive. *Harvard Business Review*, 73 (5), 120-134.
Porter, M. E., & Van der Linde, C. (1995b). Towards a new conception of the environmental-competitiveness relationship. *Journal of Economic Perspectives*, 9 (4), 97-118.
Portney, P. R. (2008). The (not so) new corporate social responsibility: An empirical perspective. *Review of Environmental Economics and Policy*, 2, 261-275.
Reed, M. (1999). Collaborative tourism planning as adaptive experiments in emerging tourism settings. *Journal of Sustainable Tourism*, 7, 331-355.
Rey-Maquieira, J., Lozano, J., & Gómez, C. (2005). Land, environmental externalities and tourism development. In A. Lanza, A. Markandya, & F. Pigliaru (Eds.), *The Economics of Tourism And Sustainable Development*: Edward Elgar.
Ritchie, B., & Crouch, G. (2000). The competitive destination: A sustainability perspective. *Tourism Management*, 21, 1-7.
Ritchie, B., & Crouch, G. (2003). *The competitive destination: a sustainable tourism perspective*. Wallingford: CABI Publishing.
Rivera, J. (2002). Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences*, 35, 333-360.
Rudd, M. (2004). An institutional framework for designing and monitoring ecosystem-based fisheries management policy experiments. *Ecological Economics*, 48, 109-124.
Sabatier, P. (1999). *Theories of the Policy Process*. Boulder: Westview Press.
Sasidharan, V., Sirakaya, E., & Kerstetter, D. (2002). Developing countries and tourism ecolabels. *Tourism Management*, 23, 161-174.
Sekhar, N. (2003). Local people's attitudes towards conservation and wildlife tourism around Sariska Tiger Reserve, India. *Journal of Environmental Management*, 69, 339-347.
Selin, S. (1999). Developing a typology of sustainable tourism partnerships. *Journal of Sustainable Tourism*, 7, 260-273.
Sinclair, T., & Stabler, M. (1997). *The economics of tourism*. London: Routledge.
Sirakaya, E. (1997). Attitudinal compliance with ecotourism guidelines. *Annals of Tourism Research*, 24, 919-950.
Sirakaya, E., & Uysal, M. (1997). Can sanctions and rewards explain conformance behavior of tour operators with ecotourism guidelines? *Journal of Sustainable Tourism*, 5, 322-332.
Stonich, S. (1998). Political ecology of tourism. *Annals of Tourism Research*, 25, 25-54.
Tarui, N., Mason, C., Polansky, S., & Ellis, G. (2008). Cooperation in the commons with unobservable actions. *Journal of Environmental Economics and Management*, 55, 37-51.
Timothy, D. (1999). Participatory planning: A view of tourism in Indonesia. *Annals of Tourism Research*, 26, 371-391.
Tisdell, C. (2001). National gains from international tourism in the light of environmental factors: Further considerations. In C. Tisdell (Ed.), *Tourism economics, the environment and development: Analysis and policy* (pp. 55-67): Edward Elgar.
Tribe, J., Font, X., Griffiths, N., Vickery, R., & Yale, K. (2000). *Environmental management of rural tourism and recreation*. London: Cassell.
UNEP (1998). *Ecolabels in the tourism industry*. Paris: United Nations Environment Programme.
Velarde, S., Malhi, Y., Moran, D., Wright, J., & Hussain, S. (2005). Valuing the impacts of climate change on protected areas in Africa. *Ecological Economics*, 53, 21-33.

Waddock, S. A. (1989). Understanding social partnerships: An evolutionary model of partnership organizations. *Administration and Society*, 21, 78-100.

Wade, R. (1988). *Village republics: Economic conditions for collective action in South India*. Oakland: ICS Press.

Wittman, D. (1989). Why democracies produce inefficient results. *Journal of Political Economy*, 97, 1395-1424.

Wittman, D. (1995). *The myth of democratic failure: Why political institutions are efficient*. Chicago: University of Chicago Press.

WSTB (2004). *Methods of Nonmarket Valuation. In Valuing Ecosystem Services. Toward Better Environmental Decision-Making*. Washington, D.C.: The National Academies Press.

WTO (2001). *Public-Private Sector Cooperation: Enhancing Tourism Competitiveness.* Madrid: World Tourism Organization.

WTO (2002). *Voluntary initiatives for sustainable tourism: Worldwide inventory and comparative analysis of 104 eco-labels, awards and self-commitments*. Madrid, Spain: WTO.

WTO (2003). *Co-operation and partnerships in tourism: A global perspective*. Madrid, Spain: WTO.

WTO (2004). *Indicators of Sustainable Development for Tourism Destinations: A Guidebook.* Madrid: World Tourism Organization.

Chapter 3: Voluntary environmental contributions under open access

3.1. Introduction

The tourism industry is a rapidly changing industry. Technological improvements, modifications in preferences, and other factors have caused tourism destinations to increasingly compete in a dynamic international context. Within this framework, environmental factors have gained major importance (Huybers & Bennett, 2002b, 2003; Ritchie & Crouch, 2000, 2003; WTO, 2004). Natural assets at tourism destinations and sustainable tourism development are growing topics in the tourism literature (Green, Hunter, & Moore, 1990; Hardy & Beeton, 2001; Hassan, 2000; Hunter-Jones, 1997; Huybers et al., 2003; Rege, 2000; WTO, 1999, 2004). However, this literature has not as yet thoroughly analyzed the implications of these topics on policy.

This chapter builds on the literature about the economic consequences of voluntary environmental actions taken by tourism firms and extracts some conclusions for environmental policymaking, which have not been previously considered. First, the empirical evidence is analyzed as if firms' decisions where non-strategic. This has been the conceptualization of the results derived from this literature to date, and assumes that individual firms make their decisions without considering the repercussions on others' behavior. Second, this analysis is broadened so that we consider that agents behave strategically. In this case, it is assumed that the behavior of one firm influences the decision making of others and *vice versa*.

Overall, this chapter contributes to the current understanding by postulating three challenges to the traditional 'tragedy' expectations of the management of the natural 'commons.' First, empirical evidence from the literature reviewed demonstrates that the belief, as assumed by the tragedy of the commons, that environmental provision at the firm level is costly does not totally hold. Second, when this empirical evidence is conceptualized within a framework of strategic behavior, the resulting game differs from the expected prisoner's dilemma. Third, case study literature on tourism collaborations and partnerships for sustainability reveals that they constitute a viable alternative for environmental management and therefore voluntary action is possible. These three challenges have major policy implications for environmental policymaking at tourism destinations. Therefore, this chapter aims to be a first step in understanding the background economic forces that foster voluntary environmental actions and, at the same time, promote future research on the management of natural tourism resources. This chapter restricts its analysis to economic incentives even though it should be noted that other non-

economic incentives might also be in place. These incentives are beyond the scope of this research.

3.2. Environmental policymaking

Under the traditional view of environmental management, derived from *The Tragedy of the Commons* (Hardin, 1968), users of natural resources are trapped in a situation that inevitably leads to the overuse and depletion of the resources. Rational users seek to maximize their private gain, demanding additional units of the resource until their individual benefits equal the expected costs that are shared by all users. As Hardin puts it, "ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons." (Hardin, 1968: p.1244).

Since then, the expression *The Tragedy of the Commons* has come to symbolize the degradation of the environment by overuse (Ostrom, 1990). Recently, this idea has been explored with tourism destinations and tourism products. The foundations for this exploration lie with the recognition that tourism is a composite commodity and mixed good, certain parts of which possess the non-excludability and subtractability properties that characterize common pool resources (Briassoulis, 2002; Healy, 1994). These are subject to problems from overuse, lack of investment incentive, and general mismanagement (Briassoulis, 2002; Healy, 1994; Sinclair & Stabler, 1997). Consequently, the specific idea of *The Tragedy of the Tourism Commons* (Briassoulis, 2002), including the natural assets at tourism destinations, was launched.

This situation has been modeled theoretically and it has been found that, under certain situations, underinvestment in environmental protection is actually the optimal investment strategy for private agents at tourist destinations (Calveras & Vera-Hernández, 2005; Candela & Cellini, 2006; González, León, & Padrón, 2006; Pintassilgo & Albino, 2007). This theoretical perspective reinforces the pessimistic view of the open access to natural assets at tourist destinations. No voluntary investment in environmental quality is expected by users of the resources.

Policymaking derived from these foundations is designed by considering only the existence of such 'free riding' firms. Under this view, public administration or privatization of the resources has been proposed as providing the *only* solution if depletion is to be avoided (Ostrom, 1990).

However, managers and other agents at tourism destinations have tried to find alternative solutions. Voluntary initiatives by users of natural attractions are emerging and are being successfully implemented all around the world, demonstrating that there are other viable solutions. These are comprised of actions such as best practice (for example, the tour operators initiative for sustainable tourism development), environmental management systems (for example, ISO 14001 and EMAS), or tourism collaborations and partnerships for sustainability (see some

examples in Bramwell & Lane, 2000; WTO, 2001, 2002). In all cases, the actions refer to decisions that are taken at the firm level without legal imposition.

Academic research has lagged behind the actual execution of voluntary actions and has not thoroughly considered their practical applicability as a viable alternative to command-and-control environmental policy. The existing research has concentrated on the descriptive characterization of these voluntary environmental actions. This approach lacks the analytical and theoretical richness, which would enable researchers to understand reality and use experiences to improve future policymaking. In order to take such an approach, it will be necessary to gather knowledge on the actual economic incentives necessary for tourism firms to undertake voluntary environmental management.

3.3. Voluntary environmental initiatives: the mainstream literature

The mainstream literature on the economic consequences from voluntary environmental action is based on economic analyses of the manufacturing industries. It is necessary to include this literature to complement the existing information from the tourism industry, as presented in section 3.5, since it does not have well-established structure or background theories. The original motivation for this research was based on complaints by US executive managers about more stringent environmental laws that were passed during the 1960s and 1970s. These laws were accused of reducing the companies' capacity to make profits, and, thus, the idea of a possible trade-off between green and competitive objectives was considered to be moot.

The first studies that tried to clarify this debate were mainly restricted to analyzing whether the environmental and economic performance variables were related. Thus, authors conduct research on whether it pays to be green. Generally an all-or-nothing approach based on correlation studies is adopted. Results show a weak positive correlation between the environmental and economic performance of manufacturing firms with varying significance for the different variables and time periods under consideration (Bragdon & Marlin, 1972; Chen & Metcalf, 1980; Jaggi & Freedman, 1982; Mahapatra, 1984; Spicer, 1978).

This initial research evolves towards more specific complementary questions. It is asked *what green initiatives pay?* Authors addressing this question demonstrate that there is no common economic consequence for all types of environmental management initiatives (Hart & Ahuja, 1996; Judge & Douglas, 1998; King & Lenox, 2002; Klassen & Whybark, 1999; Rennings, Ziegler, Ankele, & Hoffmann, 2006; Russo & Fouts, 1997; Thomas, 2001). In general, preventive initiatives and pollution control measures are found to be significantly associated with increased economic results. On the contrary, reactive approaches and pollution

control methods are associated with either insignificant or negative impacts on the bottom line.

Also, the internal and contextual factors that enable some firms to obtain positive results from environmental actions have been researched. In this case, the research question is *when does it pay to be green?* Studies on internal factors have been shown to be significantly influenced by the economic results depending on previous managerial decisions (King et al., 2002), the capacity to adequately coordinate different management departments (Judge et al., 1998), having the strategic organizational resources necessary for adoption of pollution prevention measures (Klassen et al., 1999), and the general innovativeness of the firm (Christmann, 2000). Other empirical applications, which consider contextual factors, show the influence of the country that the firm is located in (Wagner, Van Phu, Azomahou, & Wehrmeyer, 2002) as well as certain influences that are specific to the industry (Clarkson, Li, & Richardson, 2004; Christmann, 2000; Klassen et al., 1999; Nehrt, 1996; Rennings, Schröder, & Ziegler, 2003; Wagner et al., 2002).

Additionally, the literature has addressed the question of *until when does it pay to be green?* The motivation for this research comes from the recognition that each firm has its optimum abatement level, where the marginal private cost of abatement equals the marginal private benefit of the last abated unit. When firms reach this optimum abatement level, continuing abatement will cause economic losses to appear. Studies on this aspect are not as common and the results are limited to evidence suggesting that manufacturing firms are capable of generating economic gains by over complying with current environmental regulations (Dowell, Hart, & Yeung, 2000; Konar & Cohen, 2001; Nehrt, 1996).

And the last question is *do stock-holders reward green firms?* This question asks whether there is a significant difference in the market returns for environmentally responsible firms with respect to the general market. The results in this area point to weak evidence of a positive market reaction to responsible environmental performance (Clarkson et al., 2004; Cormier, Magnan, & Morard, 1993; Derwall, Guenster, Bauer, & Koedijk, 2005; Yamahita, Sen, & Roberts, 1999). However, it is still not clear whether this result comes from an actual stable positive valuation of green firms by the capital markets or from a temporary miss pricing situation.

In summary, the results suggest that different environmental initiatives, for different types of firms, which are undertaken with different intensities lead to different economic consequences. The current state of research is advanced enough to empirically demonstrate that on *some* occasions it actually pays for firms in the manufacturing industry to be green. This result should be considered by managers in making decisions in order to derive the greatest advantage from available alternatives. The important conclusion from these results is that the decision whether to undertake certain (or any) environmental actions should be an informed one and is specific for each firm.

3.4. What is different for tourism firms?

The discussion in the previous section can provide some insights into the relationship between the environmental and economic performance of firms in the manufacturing sector. Based on empirical similarities, it has been suggested that service firms could benefit from much of the research, models, and frameworks, which were developed to guide the environmental policies of manufacturers (Foster, Sampson, & Dunn, 2000). However, there are special characteristics of tourism firms that should be considered.

First, the environmental performance variables that should be considered will be different from those in the mainstream literature. For example, applying variables accounting for the toxic emission of pollutants would generate a useless homogenous classification of all tourism firms as non-emitting. Hence, other variables should be selected that better capture the realities of the tourism industry and, at the same time, its aggregate harming potential. In this respect, resource consumption or waste generation constitutes the best alternative while environmental management variables are the second best alternative. These latter variables have been more extensively used due to availability of data.

Second, there are some important characteristics of services that influence the environmental and technological innovative behaviors of firms (Foster et al., 2000; Gallouj & Weinstein, 1997), including tourism firms (Orfila-Sintes, Crespí-Cladera, & Martínez-Ros, 2005). These characteristics are relevant to the present research since the environmental technological innovations are the source for improved environmental behavior. The most relevant characteristics are: (i) the close interaction between production and consumption, (ii) the time-perishability of services, (iii) the heterogeneity of the types of firms in the tourism industry and of the services produced within a given firm, and (iv) the existence of tour operators as intermediaries between the demand and supply of the industry which conditions the market factors and competition.

Third, the time between the causes and effects is more complicated for the tourism industry than for manufacturing. Depending on seasonal components of the destination and the selling procedure of the tourism product, different temporal gaps can exist between the firm's activity and its repercussion on the balance sheet. In these circumstances, isolating the lagged effect derived from the environmental activities and those from business as usual can be even more difficult.

Fourth, the availability of relevant information for tourism firms is more limited than for manufacturing, precluding empirical research in the area. Efforts by the WTO and other institutions to foster the generalization of sustainable indicators for the tourism industry (WTO, 2004) will help to improve this situation, making it possible to develop more thorough research in the future.

Last and most important, unlike the manufacturing industry, the environment is not only a productive factor for tourism firms (developing an input function) but is also a part of the final tourism product being sold (or output function). The type of

environmental management problems and subsequent policy implications that derive from each of these two functions are substantially different. On one hand, natural resources as an input vector are related to appropriation problems. These refer to situations where the total amount of resources available for appropriators is taken as given and ergo the problem to be solved relates to excluding other potential beneficiaries and allocating the subtractable flow (Ostrom, Gardner, & Walker, 1994b). On the other hand, the output function of the resources is related to provision problems. In this case, the management problem is related to either creating a resource, maintaining or improving the productivity of the resource, or avoiding its destruction (Ostrom, Gardner, & Walker, 1994a). When conceptualizing the empirical evidence for the economic consequences from environmental management for tourism firms the results from either or both of these functions will need to be included, which is currently difficult due to a lack of research in this area.

Therefore, there are two main types of voluntary environmental initiatives by tourism firms. On one hand, firms can include environmental considerations in their operational management, which can affect directly economic performance through competitive and financial advantages; and indirectly, as a result of the destination's increased competitiveness (Claver-Cortés, Molina-Azoín, Pereira-Moliner, & López-Gamero, 2007). This type of initiative includes more efficient use of raw materials, reduction of pollution emissions, greener purchasing, etc. Environmental management systems (e.g., ISO 14001) address this type of environmental efforts, enabling organizations to develop and implement a policy and objectives relating to those environmental aspects that the organization identifies as those that it can control and influence. These usually include green purchasing initiatives, which can at least partially pressure providers and suppliers. On the other hand, in addition to operational management, tourism firms might voluntarily undertake environmental investments to directly improve the outcome dimension of the environment. Examples of this include a hotel improving the quality of the beach next to it, a coral reef excursions company cleaning its diving area, etc. These investments may be in pure public goods or common pool resources and therefore firms may not be able to exert any significant influence on the overall resource through their own actions when the resource is widely used by other agents and/or when the market structure is highly atomized. However, when the resource is a local public good or common pool resource, as certain tourism resources are, and the market structure is more concentrated, a marginally positive effect might result from the firm investing in improving the quality of the environment (as well as for other firms at the destination that can free ride on this investment).

3.5. Voluntary initiatives by tourism firms

The literature addressing the economic consequences of voluntary environmental initiatives is very recent and is scarce for tourism firms. In the past, limited efforts have been made to bring attention to the benefits that could be gained by a broader and deeper commitment to the environment by service organizations (Davis, 1991; Foster et al., 2000; Grove, Fisk, Pickett, & Kangun, 1996). In the public policy literature, little attention has been paid to assessing firms' economic benefits which are derived from participation in voluntary environmental programs (Rivera, 2002). Yet, given their non-mandatory nature, voluntary programs must generate short-term economic gains to promote over compliance, since participation is self-enforcing (Khanna, 2001). It took more than 30 years for empirical literature on it "pays to be green" to move from the manufacturing industry and address tourism firms. However, once the move was initiated the literature has rapidly evolved to include sophisticated statistical methodologies that enable researchers to begin to understand the forces behind the environmental–economic relationship (see table 3.1 for a characterization of these studies). However, studies have only addressed hotels. These are considered to be the most representative units of the tourism industry, since they provide basic accommodation services for tourists and impact the environment (Álvarez, Burgos, & Céspedes, 2001; Carmona-Moreno, Céspedes-Lorente, & de Burgos-Jimenez, 2004; Claver-Cortés et al., 2007; González & León, 2001; Parra, García, & Guitiérrez, 2004).

The first studies addressing this topic were case studies. These analyze particular firms and lack statistical generalizations. Enz and Siguaw (1999) examine four hotels that were named as U.S. environmental best-practices champions by the Cornell University School of Hotel Administration. All hotels agree that cost savings, operating efficiencies, and excellent marketing opportunities derive from their environmental initiatives and provide several examples of each. Goodman (2000) addresses the case of Scandic Hotels, the biggest hotel chain in Northern Europe. This company was on the verge of collapse in the early 1990s but achieved a turnaround that was in part due to a new environmental responsibility. Partnerships with suppliers proved to be crucial for Scandic's sustainability program. With its large volume of purchases, Scandic was capable of imposing very restrictive environmental conditions on their suppliers, encouraging them to introduce product and process innovations. This became a win–win situation where Scandic obtained its environmental objectives (and its derived economic improvements) and suppliers gained market differentiation and a competitive advantage. The main conclusion from this study is that sustainable action is not solely the domain of financially secure companies.

Table 3.1. Literature on the relationship between the environmental and economic performance of firms.

Study	Sample	Environmental variables	Economic variables[i]	Methodology	Results
Enz, 1998	4 Hotel US	-	-	Case Study	+
Goodman, 2000	Hotels Sweden	-	-	Case Study	+
Álvarez et al., 2001	296 Hotels Spain	Environmental cost and savings, training, ecological purchasing, ecological marketing campaigns, customer environmental cooperation, and energy, water and waste savings	Occupancy rate, current-year profitability and profitability over the last three years. Self-reported.	Cluster analysis and ANOVA	+
Rivera, 2002	164 Hotels Costa Rica	Management of the physical and biological environment and of hotel facilities, guest environmental education, and cooperation with local communities.	Prices and sales.	ANOVA Regression	+/ no sign
Carmona-Moreno et al., 2004	268 Hotels Spain	Environmental management (technological and organisational practices on pollution prevention and control), recognition of environmental issues as a strategic capability and previous experience.	Subjective profitability.	Cluster analysis and ANOVA	+/ no sign
Kassinis and Soteriou, 2005	104 Hotels Europe	Use of energy saving measures, recycling practices and water saving measures.	Growth in profits, growth in revenues and market share Self-reported.	Regression	+
Claver et al., 2007	114 Hotels Spain (Alicante)	Environmental certificates, environmental cost and savings, training, ecological purchasing, ecological marketing campaigns, energy and water savings.	Occupancy rates, total gross operative profit, gross operating profits and subjective evaluations. Self-reported.	Mann-Whitney's U-test	+/ no sign

[i] Economic variables have been classified according to the type and information content of the variable. Additionally, when the source is self-reports, a remark has been included inside brackets. The types of variables considered are included in the first line: accounting, market and mixed variables. The different information content they include is firms' profitability, risk or growth.

Next, studies moved on to statistical methodologies at the same time that recognize some of the specific characteristics of tourism. For example, studies measure hotels' environmental performance by means of their management activities rather than toxic pollution emissions. Álvarez et al. (2001), Carmona-Moreno et al. (2004), and Claver et al. (2007) study whether significant differences exist in

economic results for hotels with different environmental behaviors. All these studies first use cluster analysis to identify groups of hotels with similar environmental strategies. Next, Álvarez et al. (2001) and Carmona-Moreno et al. (2004) estimate the significance of differences in occupancy and profitability between the groups by means of an ANOVA test whilst Claver et al. (2007) undertakes a Mann–Whitney's U-test for two independent samples using Bonferroni's correction.

Álvarez et al. (2001) and Carmona-Moreno et al. (2004) conduct their empirical examinations on the relationship between environmental and economic performance of Spanish three to five star hotels within a wider research framework, which is different for each study. Álvarez et al. (2001) address the determinants of environmental innovations and complete their study with a mention of the economic consequences of different degrees of environmental involvement. In their sample, occupancy is shown to be significantly higher for the more environmentally proactive hotels, and profits for last year and the last three years are significantly higher for the most proactive group of hotels. The authors interpret these results as evidence that financial performance is contingent upon the particular environmental protection policy deployed by the firm. Claver et al. (2007) replicates the final part of the study by Álvarez et al. (2001) using a sample of hotels in a particular Spanish region, Alicante. Their estimates are weaker, and only the occupancy rate per bed is significantly higher for more proactive hotels with respect to the reactive group. Other performance variables that were considered (total gross operative profit and gross operating profit) do not significantly vary with the firms' environmental strategy. The authors partially attribute these results to the fact that the application of environmental strategies was very recent for the region analyzed. It is assumed that time is required for the environmental management practices to impact the bottom line, which is consistent with evidence in the manufacturing literature (Hart et al., 1996). Therefore, they consider that performance levels might increase in the future.

Carmona-Moreno et al. (2004) concentrate on how contextual factors (stakeholder influence, chain affiliation and size) influence hotels' proactive environmental management and in turn how the type of environmental management determines firms' environmental and economic performance. When comparing the economic performance among different groups of firms, it is found that hotels with the lowest values for all environmental management variables, on average are significantly less profitable than the rest. According to the authors, this suggests that for hotels, environmental differentiation can be an order qualifier, though it is not clear that it can be an order winner criterion. Consequently, the use of more formalized procedures in the future for the identification of the direction of the relationship between the variables is needed.

This is what Rivera (2002) attempts to do. The author empirically analyzes the link between enrollment in voluntary environmental programs and price premiums or enhanced sales. He makes use of a sample of Costa Rican hotels including some establishments that were participating in the Costa Rican Certification for

Sustainable Tourism. After correlation and mean comparisons, consistent with the above results, are undertaken, the analysis is extended to include a recursive two-stage estimation method that corrects for self-selection bias and provides consistent estimates of participation benefits. Results support the hypothesis that hotels with higher levels of environmental performance are significantly related to higher room prices (about $30 per night higher than the room prices of hotels not enrolled in voluntary programs). Nevertheless, participation in the program, without showing a superior level of environmental performance, does not result in price premiums. The author interprets this finding as evidence that firms that enroll in the voluntary system with free riding purposes are not gaining significant price premiums, which is an indicator of the strength of the system. As in the case of Álvarez et al. (2001), results for occupancy are less clear. The model for occupancy explains much less variance and does not report any significant relation between environmental performance and enhanced sales.

Kassinis and Soteriou (2005; 2003) conduct further research in this respect with a more complex approximation. Highlighting the distinctive characteristics of services, vis-à-vis goods, and building on Heskett et al.'s (1994) service profit chain, Kassinis and Soteriou claim that environmental practices are arguably built into the service design and, as such, might impact the customer. They empirically test a structural equation model on a sample of hotels from superior deluxe to first class at top European tourist destinations (including Austria, France, Germany, Greece, Italy, Portugal, Spain, and the United Kingdom), which have more than 10 million tourists per year. Results show a significant and positive impact of environmental management practices on satisfaction, of satisfaction on loyalty and lastly, of loyalty on economic performance. No additional direct effect of environmental management practices on economic performance is found. This means that any influence that environmental management practices have on the economic results of hotels is channeled though a demand effect and not through cost reduction. This result is consistent with Rivera's (2002) findings, and is supported by complementary research in this area. It has been estimated that hoteliers' perception of the importance of environmental resource management is significantly greater as the firm's control over pricing increases (Parra et al., 2004). Additionally, it has been noted that hotels that have initiated environmental improvements are more likely to associate environmental management with increased profitability and marketing advances (Kirk, 1998). It has also been noted that more environmental innovations are undertaken by accommodation establishments where adoptive behavior is predominantly driven by the demand side (González et al., 2001).

However, it must be remembered that findings about a demand effect determining increased economic results from environmental performance by firms may be influenced by the dataset considered. Influences on results may arise from the upper level accommodation establishments under analysis, the type of environmental management practices considered in the analyses, the intensity of the environmental practices in place, or the nature-based character of the tourism destinations.

3.5.1. The first challenge

This demand effect implies that tourism firms that undertake voluntary environmental actions are offering a different product than other firms at the destination and this is valued by consumers. This is consistent with the recognition of the increased environmental awareness of tourists (Moutinho, 2000; Poon, 1994). Most conservative estimates show that up to 5% of the overall travel market would pay a premium for sustainable packages (Dodds & Joppe, 2005). This is a small percent compared with certain regional results, such as that of Asia, where 52% of visitors would be prepared to pay a 10% extra for environmentally-friendly tourism products (PATA, 2007). This effect is particularly relevant at nature-based tourism destinations, where the quality of the experience is directly related to the quality of the environment (Huybers & Bennett, 2002a). Some examples are the Balearic Islands and North Tropical Queensland. In the former, the decisive factor increasing the probability of higher overall satisfaction includes scenery, beaches, environment, and cleanliness of public areas (Alegre & Cladera, 2006). Visitors that are mainly concerned with the quality of their surroundings spend 27% more at the destination (Alegre & Juaneda, 2006). In the latter, the lower boundary estimate for the willingness to pay by origin markets for an increase in the environmental quality from somewhat spoiled to unspoiled is more than US $480 for a fortnight's holiday (Huybers et al., 2002b). Thus, at most nature-based tourism destinations, firms are able to charge more for their products.

Altogether, the results are surprising. The initial research provides consistent evidence that for a certain proportion of firms in the tourism industry it pays to undertake voluntary environmental actions. This evidence represents a first challenge to the tragedy of the tourism commons when it is conceptualized as non-strategic, for example for atomized market structures where the behavior of a single firm does not influence the behavior of others. In these situations, the tragedy of the commons expects that the environmental quality provision is a costly activity for the users of the resources and thus underinvestment will be preferred. However, empirical evidence does not totally conform to this expectation. It has been shown that there is at least a proportion of firms in the tourism industry that realize higher economic gains when conducting environmental management practices. These firms will deviate from tragic overuse expectations and voluntarily provide environmental quality to the destination. This deviation does not constitute a situation where the free riding incentives described by Hardin are ignored, but an example where the underlying motivation for free riding behavior is not totally in place.

However, costs and benefits from voluntary actions are expected to vary among firms that are heterogeneous in their technologies and products. Therefore it would be rational for some firms to undertake voluntary environmental initiatives and for other not to (Khanna, 2001). Due to the particular heterogeneity of tourism firms and products generated within firms, it can be assumed that even though certain

firms might have higher economic gains with increased levels of environmental performance, others would face increased costs from environmental voluntary initiatives and therefore would not participate. These firms would perceive free riding incentives described by Hardin (1968). Consequently, it can be assumed that the resulting situation is a mixture where certain firms are subject to underlying conditions leading to *tragedy* outcomes while others are not. Ergo, voluntary environmental initiatives, at least by a proportion of firms in the tourism industry, are viable.

3.6. Strategic voluntary environmental behavior in tourism

Sections 3.3 and 3.5 considered individual decisions undertaken by non-strategic firms taking the business environment as given. The present section recognizes that the environmental behavior of individual firms can have a significant influence on others and vice versa. This effect will appear in situations where the market structure is more concentrated and thus a strategic component arises. Under concentrated market structures, a strategic perspective of voluntary environmental actions is more likely because of weaker incentives for free riding, lower costs of inter-firm coordination, and greater market power and ability to differentiate products (Khanna, 2001).

In this section arguments are developed to question the usual "tragedy" point of view in the management of natural resources at tourism destinations when agents behave strategically. First, a game theory model for firms' unilateral commitments to become greener, informed by existing evidence, is built to argue that the tragedy of the commons is not an inevitable outcome in a non-cooperative rational choice strategic setting. Second, evidence on tourism collaborations and partnerships for sustainability is presented to show that voluntary coordinated initiatives can successfully build formal institutions to avoid unsustainable development in tourism destinations.

3.6.1. The second challenge

Hardin's model has often been formalized as a prisoner's dilemma game (Ostrom, 1990), where each player has the dominant strategy to defect no matter what the other player chooses. It presents a paradox where individual rational strategies lead to collective irrational outcomes (Ostrom, 1990). The structure of a prisoner's dilemma game follows the payoff relationship as shown in figure 3.1: $a_1>d_1$, $a_2>d_2$, $a_1<c_1$, $a_2<c_2$, $b_1<d_1$, and $b_2<d_2$; and generates the dominant strategies (arrows diagram) and Nash equilibrium (*) presented in the same figure.

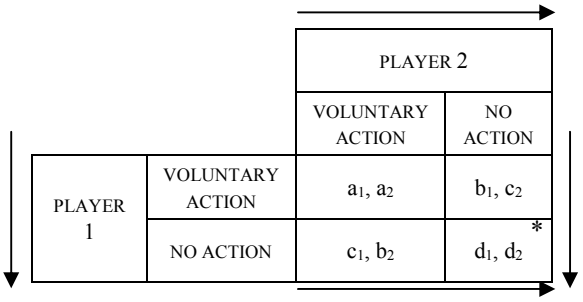

Fig. 3.1. Normal form representation of a prisoner's dilemma.

Evidence in section 3.5 is used to construct an alternative model, a simple game example of firms' unilateral commitments to become greener at nature-based tourism destinations. The game considers N potentially asymmetric players with complete information and single, simultaneous, and independent decisions by players. Available strategies for each player are whether or not to undertake voluntary environmental actions – by the means and intensity most appropriate to them. Payoffs can be asymmetric in the sense that the benefits and costs derived from actions and outcomes can differ for each player.

Firms obtain different payoffs that are dependent on the strategy selected. This contingency can be motivated by a demand effect that generates a competitive/comparative advantage for the firms that undertake voluntary environmental actions (Kassinis et al., 2005; Parra et al., 2004; Rivera, 2002). As explained in section 3.4, this demand effect might result from a differentiation of green firms with respect to other firms at the destination or from an improvement in the environmental quality at the destination, positively affecting all firms (Claver-Cortés et al., 2007). Consistent with evidence found by Rivera (2002), Hubers et al. (2002b), and PATA (2007), these effects are assumed to affect the price. Thus the former effect implies that when player i undertakes voluntary environmental actions it is capable of charging an extra price, $\delta_i(\cdot)$ in equation 3.1, with respect to the other firms at the destination. This $\delta_i(\cdot)$ differential is always positive for firms improving their environmental performance and diminishes with the number (n^g_{-i}) of other firms at the tourism destination undertaking voluntary environmental actions. The latter effect considers the output dimension of the environment for the tourism industry and the positive externalities that might be generated by players when undertaking voluntary environmental management. Environmental actions by player i may increase the quality of local public goods or common pool resources that are part of the tourism experience, and in this way may have a positive effect on tourism prices. Due to the non-excludability of these types of resources, other firms can also partially take advantage of it. Then, all the tourism firms using that natural resource may charge extra, $\gamma_i(\cdot)$, for their products with respect to other tourism products of firms at the same or at different destinations (see equation 3.1). This $\gamma_i(\cdot)$ differential would increase as long as the number

(n^g) of firms that voluntarily invest in the resource's quality increases. When these effects are combined, the price at which player *i* sells its tourism product is equal to:

$$P_i = x + \delta_i(n^g_{-i}) \cdot d_i + \gamma_i(n^g) \text{ , for } \forall n^g \geq 0 \text{ and } \forall n^g_{-i} \geq 0 \tag{3.1}$$

where *x* is a part of the price which is independent of environmental actions and d_i is a dummy variable, which is equal to 1 when the firm undertakes voluntary initiatives and 0 when the firm does not. Minimum attributes to define $\delta_i(n^g_{-i})$ and $\gamma_i(n^g)$ are,

$$\delta_i(n^g_{-i}) = \begin{cases} z_i \geq 0 & \text{if } n^g_{-i} = 0 \\ 0 \leq \delta(\cdot) \leq z_i & \text{if } 0 < n^g_{-i} < N-1 \\ 0 & \text{if } n^g_{-i} = N-1 \end{cases} \text{ , and } \frac{d\delta_i(\cdot)}{d(n^g_{-i})} < 0$$

$$\gamma_i(n^g) = 0 \qquad \text{if } n^g = 0 \qquad \text{, and } \frac{d\gamma_i(\cdot)}{d(n^g)} \geq 0$$

On one hand, $\delta_i(\cdot)$ exercises a positive price effect for a firm that differentiates from others through voluntary environmental action (d_i=1). This effect tends to dissipate as the number of "green" firms increases. $\gamma_i(\cdot)$ is assumed to be independent of d_i, which implies that all firms using the natural resource will benefit from an increased price independent of who is making the environmental contribution. The specification of $\gamma_i(\cdot)$ includes the special cases when the firm has no sizable influence on the environmental quality of the natural resource or when its product is such that it does not benefit from an increased quality of the resource.

A profit function for players can be constructed as follows:

$$\Pi_i = q_i \left[x + \delta_i(n^g_{-i}) \cdot d_i + \gamma_i(n^g) \right] - c_i \cdot d_i - co \tag{3.2}$$

where q_i is the quantity produced by the *i*-th firm, c_i is the cost to undertake the environmental initiatives, and *co* are other costs that are independent of environmental behavior. This specification shows that only firms undertaking voluntary efforts (d_i=1) will be incurring in environmentally related costs (c_i), which will be specific to each firm. Given equation 3.2, asymmetries can arise from differences in parameter values. For simplicity we rule out asymmetries in *x* and *co*, but allow for differences in $\delta_i(\cdot)$, $\gamma_i(\cdot)$, and c_i.

This game structure along with evidence presented in section 3.5 can be used to reveal some information about the payoff structure of firms. As an example, this is

done in a simple normal form game with two representative players (see figure 3.2). The payoff (equations in the cells) of the first row in the cell corresponds to player 1 and the second row corresponds to player 2. For simplicity, it is assumed that each player produces one unit of output, and to reduce the complexity of the notation, a simple linear functional form has been used to represent the effect of $\gamma_i(\cdot)$, $\gamma_i(n^g) = \gamma_i \cdot n^g$, $\gamma_i \geq 0$.

According to evidence in section 3.5, some firms in the tourism industry undertake voluntary environmental initiatives while others do not. This implies that in our strategic setting the outcomes of the game that most closely approximate the current situation are either the top right or the lower left boxes in figure 3.2.

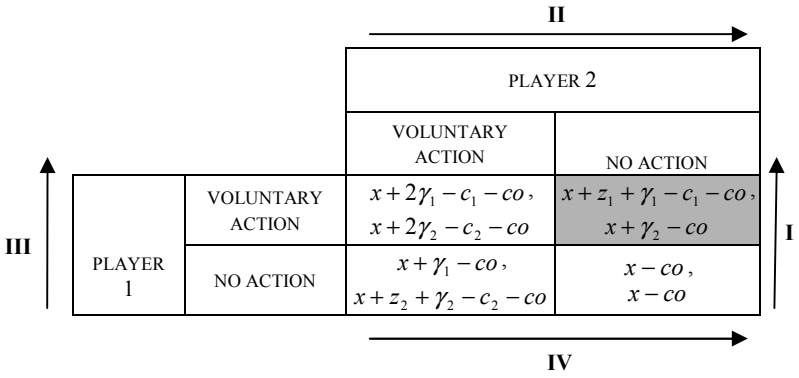

Fig. 3.2. Normal form representation of the game for voluntary environmental action by tourism firms derived from profit equation 3.2.

Let us assume that firm 1 is the one that undertakes voluntary environmental actions (grey box in figure 3.2). To extract some insights about the ordinal relationship between the payoffs, we first consider that according to empirical evidence in section 3.5, firms that undertake voluntary environmental actions perform better than those that do not. In our game setting this would imply that:

$$z_1 + \gamma_1 - c_1 > \gamma_2 \tag{3.3}$$

That is, extra profits from environmental actions that accrue to firm 1 are higher than firm 2's gains from free riding behavior.

Additionally, if the situation in the grey box is the result of rational choice, firm 1 must be better off undertaking voluntary action, as long as firm 2 is not doing so, and firm 2 prefers not to undertake environmental initiatives, as long as firm 1 is doing so. These conditions are respectively met when the following inequalities hold:

Condition I: $c_1 < \gamma_1 + z_1$ (3.4)

Condition II: $c_2 > \gamma_2$ (3.5)

Conditions I and II are sufficient conditions to guarantee that the grey box is a Nash equilibrium. According to condition I, the competitiveness improvement that stems from the environmental actions that firm 1 undertakes to differentiate itself from other firms at the destination (generating a $\delta_i(\cdot)$ and $\gamma_i(\cdot)$ effect) compensate their implementation costs. According to condition II, increases in price for firm 2 resulting from a "green" behavior that does not contribute to differentiation (then only generating a $\gamma_i(\cdot)$ effect) do not compensate for the extra costs. It can be noted that equation 3.3 implies condition I, and therefore empirical evidence supporting equation 3.3 shows condition I as a reasonable possibility.

In addition, when conditions III and IV below hold, both firm 1 and firm 2 have dominant strategies where preferred strategies for each player are different. That is, conditions I and III guarantee that undertaking environmental actions is a dominant strategy for firm 1, whereas conditions II and IV imply that not undertaking those actions is a dominant strategy for firm 2. It is obvious that for this to happen, the firms must have asymmetric payoff functions.

Condition III: $c_1 < \gamma_1$ (3.6)

Condition IV: $c_2 > \gamma_2 + z_2$ (3.7)

A unique Nash equilibrium in the grey box would also result, but without dominant strategies, if either conditions I, II, and III, or conditions I, II, and IV hold. In addition, it can be seen that when conditions I and II hold and conditions III and IV do not, this leads to a situation of two pure strategies, asymmetric equilibria, where one player undertakes voluntary environmental action and the other does not. Both equilibria are consistent with the evidence that some firms voluntarily improve their environmental behavior and some do not. It is interesting to note that this later case would admit the possibility of symmetric players.

In any case, a crucial condition for obtaining a non-tragedy outcome in our game setting is the existence of firms in the tourism industry whose costs to improve their environmental performance are smaller than potential price premiums related to their voluntary actions (deriving both from $\delta_i(\cdot)$ and $\gamma_i(\cdot)$). Evidence in section 3.5 shows this is a reasonable possibility.

This result should not be interpreted as a claim of the existence of an "invisible hand" that would lead actors behaving selfishly to achieve social optimum outcomes. First, there is no evidence that the current results coincide with the social optimum. Second, although the evidence that informs the model is not the result of legal enforcement, the influence of informal or unobservable institutions not included in the game cannot be ruled out. Norms of behavior or shared strategies by agents at the destination such as mutual obligations, the need to develop trust for

longer term knowledge or resources sharing, etc. may enable the development of voluntary initiatives. Finally, lab and field experiments show that face-to-face communication, past experience, trust, and others also influence the way users manage their natural assets (Cardenas, 2001, 2003; Ostrom et al., 1994a).

3.6.2. The third challenge

Additionally, tourism collaborations and partnerships are being implemented all over the world. These are successful examples of formal self-governing institutions by users of resources that demonstrate the viability of voluntary initiatives at tourism destinations for a better management of their shared resources. Under the principles of the tragedy of the commons, these are unexpected realities, constituting a third challenge to the tragedy expectations.

Tourism collaborations and partnerships for sustainability lead to modification of the rules-in-use at the destination and can change the results derived from the use of common pool resources, enhancing the well-being of the agents. Formal endogenous institutions can influence the game users play (Ostrom et al., 1994b). These can create new positions that players can hold (e.g., monitors or sanctioners), modify the actions that each of them can develop (abatement levels), and influence payoff functions (e.g., differences for obeying or breaking a prescription) among others. This is not a phenomenon restricted to tourism since there is a wide range of examples for other common pool resource situations where the prediction from mainstream economics that zero voluntary cooperation is inevitable is too pessimistic (Marshall, 2005; Ostrom, 1990; Ostrom et al., 1994a). But it can not be directly extrapolated to all tourism destinations either. First, there are tourism destinations whose appeal is only weakly related to their environmental quality and therefore efforts to preserve their natural resources might be small. Second, there are examples of nature-based tourism destinations that have actually overexploited their natural assets, thereby loosing their appeal and stagnating (Butler, 1980; Knowles & Curtis, 1999; Morgan, 1991).

However, the existence of successful tourism and collaboration partnerships for sustainability shows that in the future, coordinative solutions should be seriously considered for better management of natural tourism commons. These realities do not demonstrate that the tragedy of the commons does not exist, but rather that on certain occasions, users of the natural resources are capable of overcoming free riding incentives by means of endogenous institutions. Consequently, this evidence compromises the validity of panaceas based on tragedy expectations and provides policy implications for nature-based tourism destinations.

Further research should be conducted on the strategic behavior behind these realities. Most of the empirical research conducted to date on tourism collaborations and partnerships for sustainability has been based on case study methodology (see the special edition of the Journal of Sustainable Tourism Vol. 7, nos. 3&4, 1999;

Bramwell et al., 2000; WTO, 2001, 2002). Until now, no rigorous meta-analysis of case studies has been undertaken to identify the regularities within stories of success and failure nor the disparities between the two groups.

3.7. Policy implications

The outcomes resulting from environmental policies are crucially dependent on the incentive structure of agents. In fact, wrong or incomplete information about agents' incentives can be an important source of policy failure. Policies may change the contextual factors in which the firms operate without controlling the consequences. If policymakers do not understand how particular combinations of rules affect actions and outcomes in particular situations, policy changes may produce unexpected and, at times, disastrous outcomes (Ostrom, 2005). That is why it is necessary for environmental policymaking at tourism destinations to consider the possible existence of incentives for private agents to implement voluntary environmental actions. But environmental policymakers at tourism destinations are developing policies without all the relevant information. These policies are usually designed considering only the existence of free riding agents and neglecting endogenous institutions for common pool resources' management. Moreover, most tourism literature is still supporting simple solutions for solving complex problems that are related to achieving sustainable tourism (for example Hjalager, 1996). These are panaceas in the sense of Ostrom, Jassen, and Andreides (2007) and refer to recommendations that a single system (e.g., government intervention, privatization, or community property) should be applied to all environmental problems. However, simple solutions for complex socio-ecological systems should be taken with caution, since the track record of panaceas is one of frequent failures (Acheson, 2006). Empirical evidence shows that when complexity is not understood, conservation policies for human-nature couplings can generate unintended, perverse results (Liu, Dietz, Carpenter, Alberti, Folke, Moran, Pell, Deadman, Kratz, Lubchenco, Ostrom, Ouyang, Provencher, Redman, Schneider, & Taylor, 2007).

Thus, according to Ostrom (2000), much of the contemporary policy analysis and the policies adopted in many modern democracies crowd out endogenous cooperative behavior. Consistently, the review by Frey and Jegen (2001) presents several laboratory and field experiment studies demonstrating the crowding-out effects of environmental external intervention. Examples are increased egoistic behavior of forest users when a regulatory approach is imposed (Cardenas, Strandlund, & Willis, 2000) and higher compliance with pollution standards that have lower fines for noncompliance (Livernois & McKenna, 1999). The authors defend the theory that the use of rewards in the real world is able to control people's behavior and is why they are so widely advocated; but they undermine self-regulation at the same time since people take less responsibility for motivating

themselves. Frey and Jegen's (2001) main conclusion is that crowding-out is an empirically relevant phenomenon, but it does not always prevail over the rewarding effect. In general, it is suggested that external intervention crowds out intrinsic motivation if the affected individuals perceive it to be controlling. Ostrom (2000) studies another motivation of crowding-out of environmental policies. She considers the fact that the prevailing public intervention sends two rather devastating messages to users of common pool resources: first, that only short-term, selfish actions are expected from them; and second, that they do not have the knowledge or skills needed to design appropriate institutions to solve collective-action problems. The result is a waste of human and material resources and a challenge to the sustainability of democratic institutions over time due to undermining the norms of trust and reciprocity, the knowledge of local circumstances, and the experimentation needed to design effective institutions.

In addition, public intervention might transform what has been a de facto community property into government property, which in turn might become a de facto open access under weakly enforced government-imposed regulation (Ostrom, 2000). As Cardenas et al. (2000) observe, the crowding-out phenomenon may imply that the potential welfare gains from well-intentioned but only modestly enforced environmental policies that standard theory would predict to improve the welfare are less than would be predicted.

However, it must be recognized that exogenous institutions can also crowd in intrinsic motivation. This would be the case if the individuals concerned perceive it as supportive (Frey et al., 2001), i.e., self-esteem is fostered, and individuals feel that they are given more freedom to act, enlarging their self-determination. Empirical examinations in Costa Rica suggest that in addition to market incentives, adequate institutional pressures may also be necessary conditions for adherence to environmental management systems by hotels in order to promote compliance above and beyond regulated environmental behavior (Rivera, 2004).

The practical applicability of voluntary environmental initiatives should therefore be taken into consideration in future environmental policymaking for tourism destinations. Policymakers may confront a new scenario where more opportunities for collaborative approaches in tourism arise, reflecting changes in governance as a whole in many western countries (Bramwell et al., 2000). The central government is no longer supreme, and in the polycentric state, the task of the government is to enable socio-political interactions to encourage many and varied arrangements for coping with problems (Rhodes, 1996). Both in Europe and in the United States there is active advocacy, in some business and government cycles, for an increase in environmental self-regulation (Andrews, 1998). This shift in the regulatory paradigm is driven by a desire to find cost-effective solutions to environmental problems to move towards a cooperative approach between industry and government while avoiding negative legal and political consequences that are associated with regulatory failures (Khanna, 2001).

In this new scenario, policymakers at tourism destinations should promote more suitable mechanisms for the governance of natural assets to enable voluntary

environmental initiatives. As Marshall (2005) states, in no way does this deny a vital role for the state in facilitating the provision of a large group of public goods. According to him, this alternative entails the government reinventing itself such that it complements rather than displaces or absorbs self-organizing capacities at smaller levels of social interaction.

The adoption of this new role by policymakers will require them to incur extra information finding costs. These costs are necessary to inform them about the characteristics of the agents at their destinations, their available actions, the biophysical constraints of the natural resources, and their socio-economic repercussions (Ostrom et al., 1994a). Policymakers at tourism destinations should start using a background theoretical framework for the management of natural assets, i.e., a diagnostic approach for going beyond panaceas (Ostrom, 2007). As a result, they would be more likely to select appropriate rules that lead to socially better outcomes. Both the economic and institutional contexts should be considered. The more informed the decision-making process for environmental policy is, the higher the probability of obtaining better results. The research community should recognize their responsibility to increase the knowledge base, which will permit policymakers to understand how to better craft the systems of rules for resources at tourism destinations.

It is necessary to start building a comprehensive framework for environmental policy at tourism destinations if a more adequate management of natural resources is desired. The analysis of collaborative arrangements is concerned with issues or policies that go beyond basic tourism questions and have broader economic, social, and environmental dimensions (Bramwell et al., 2000). In fact, mismanagement of natural resources by the tourism industry can generate social conflict and residents' mobilization against tourism activities (Kousis, 2000) due to their concerns about the environmental impacts of tourism (see Bujosa & Rosselló, 2007; Kuvan & Akan, 2005; Liu, Sheldon, & Var, 1987 among others). Moreover, it is claimed that the participation of a wide range of stakeholders in the development of tourism policies can bring democratic empowerment and equity, operational advantages, and an enhanced tourism (Jamal & Getz, 1995; Joppe, 1996; Timothy, 1999).

3.8. Conclusion

The literature about sustainable tourism has largely selectively neglected the implications of policies for environmental management at tourism destinations. In the past this literature has mainly concentrated on the characterization and case study reports of successful experiences. Little research has been done on the operative implications of sustainability, leading to policy prescriptions that still rely on the traditional foundations of the tragedy of the commons. As a result, either

public intervention or the privatization of resources have been proposed as panaceas.

This chapter has presented three challenges to the tragedy of the commons at nature-based tourism destinations. First, the idea that individual environmental provision by hotels is costly does not totally hold. The empirical literature on the relationship between the environmental and economic performance of tourism firms shows consistent, though partial, evidence for the hypothesis that it pays to be green. This evidence is obtained from firms in the accommodation sector when no strategic behavior is assumed. Hence, certain hotels can deviate from expected underinvestment strategies and voluntarily undertake environmental initiatives.

Second, when the empirical evidence on the economic results from environmental action is considered strategically, the resulting game differs from the expected prisoner's dilemma. This is the model that is commonly used to represent the tragedy of the commons (Ostrom, 1990). In this game, the dominant strategy of all players is not to provide environmental quality. We show that an alternative empirically founded game for unilateral commitmetns can be designed where non-tragedy outcomes can arise under reasonable restrictions on the parameter values.

Third, the evidence on tourism collaborations and partnerships for sustainability demonstrates that these constitute viable coordinative environmental management alternatives. Literature addressing them presents case studies of successful cooperative ventures. These show that collective voluntary environmental actions are viable in practice, and contradict the tragedy expectations of generalized free riding.

These three challenges to tragedy expectations are consistent with the evidence in other non-tourism common pool resource situations where the prediction from mainstream economics that zero voluntary cooperation is inevitable within large group commons problems, is too pessimistic (Marshall, 2005; Ostrom, 1990; Ostrom et al., 1994a). Environmental policymakers at nature-based tourism destinations should move forward from traditional tragedy expectations and consider a more complex reality where voluntary initiatives are viable. In this respect, environmental policy should overcome the simple command-and-control solutions that have been applied and explore other more complex institutions. Policymaking should promote mechanisms for the governance of natural assets that enable environmental actions and assume that additional information efforts are necessary costs for devising more effective policies.

This chapter aims to become a first step for the development of a research path on environmental policymaking at tourism destinations based on the application of the literature about the institutional management of natural resources (some examples being Cardenas et al., 2000; Marshall, 2005; McGinnis, 2000; Ostrom, 1990, 2005, 2007; Ostrom et al., 1994b) to tourism. This literature empirically analyzes how rules, norms, and shared strategies among users of natural resources describe opportunities and constraints that contribute to expectations about other actors' behavior and modify users' environmental performance. Research in this area has concentrated on fisheries, irrigation systems, and forestry (some applications can

be found in McGinnis, 2000; Ostrom, 1990), and virtually no attention has been devoted to tourism's use of resources.

Future research in this area should first require a meta-analysis of the case studies of voluntary environmental initiatives at tourism destinations. This can provide researchers with the regularities of the institutions within both successful and failed initiatives and the differences between them. By comparing the rules that are present in successful scenarios with those in failure situations, the critical mechanisms that determine outcomes may be identified. Second, greater effort should be expended to collect primary information about indicators for sustainability at tourism destinations including economic, environmental, social, and institutional information. Finally, the specifics of consumer services in general and the tourism industry in particular should be considered in order to extend the literature about the institutional management of natural resources to tourism. As an example, the existence of tour operators as intermediaries between the demand and supply of the industry conditions the market factors and competition, introducing principal agent strategic incentives in addition to strategic environmental behaviors. The soft environmental pressures generated by tourism are relevant for future analyses and are comparable to pressures introduced by residents, increasing the importance of simultaneously considering the environmental behavior of the industry and residents. Along with these, the close interaction between production and consumption, the perishability of services, the heterogeneity of firms in the tourism industry mean that an extension of the literature on the institutional management of natural resources to tourism settings is not straightforward, and has the potential to eventually become a specialized area of literature.

3.9. References

Acheson, J. (2006). Institutional failure in resource management. *Annual Review of Anthropology*, 35, 191-208.

Alegre, J., & Cladera, M. (2006). Repeat visitation in mature sun and sand holiday destinations. *Journal of Travel Research*, 44, 288-297.

Alegre, J., & Juaneda, C. (2006). Destination loyalty: Consumers' economic behavior. *Annals of Tourism Research*, 33, 648-706.

Álvarez, M., Burgos, J., & Céspedes, J. (2001). An analysis of environmental management, organizational context and performance of Spanish hotels. *Omega*, 29, 457-471.

Andrews, R. (1998). Environmental regulation and business `self-regulation´. *Policy Sciences*, 31, 177-197.

Bragdon, H. H., & Marlin, J. (1972). Is pollution profitable? *Risk management*, April, 9-18.

Bramwell, B., & Lane, B. (2000). Collaborations and partnerships in tourism planning. In B. Bramwell, & B. Lane (Eds.), *Tourism collaborations and partnerships: Politics, practice and sustainability* (pp. 1-19). Clevedon: Channel View Publications.

Briassoulis, H. (2002). Sustainable tourism and the question of the commons. *Annals of Tourism Research*, 29, 1065-1085.

Bujosa, A., & Rosselló, J. (2007). Modeling environmental attitudes toward tourism. *Tourism Management*, 28, 688-695.

Butler, R. (1980). The concept of a tourist area cycle of evolution: implications for management of resources. *Canadian Geographer*, 24, 5-12.

Calveras, A., & Vera-Hernández, M. (2005). Quality externalities among hotel establishments: what is the impact of tour operators? *Tourism Economics*, 11, 571-593.

Candela, G., & Cellini, R. (2006). Investment in tourism market: a dynamic model of differentiated oligopoly. *Environmental and Resource Economics*, 35, 41-58.

Cardenas, J. (2001). How do groups solve local commons dilemmas? Lessons from experimental economics in the field. *Environment, Development and Sustainability*, 2, 305-322.

Cardenas, J. (2003). Real wealth and experimental cooperation: experiments in the field lab. *Journal of Development Economics*, 70, 263-289.

Cardenas, J., Strandlund, J., & Willis, C. (2000). Local environmental control and institutional crowding-out. *World Development*, 28, 1719-1733.

Carmona-Moreno, E., Céspedes-Lorente, J., & de Burgos-Jimenez, J. (2004). Environmental strategies in Spanish Hotels: Contextual factors and performance. *The Service Industries Journal*, 24, 101-130.

Clarkson, P. M., Li, Y., & Richardson, G. D. (2004). The market valuation of environmental capital expenditures by pulp and paper companies. *The accounting review*, 79, 329-353.

Claver-Cortés, E., Molina-Azoín, J. F., Pereira-Moliner, J., & López-Gamero, M. D. (2007). Environmental strategies and their impact on hotel performance. *Journal of Sustainable Tourism*, 15, 663-679.

Cormier, D., Magnan, M., & Morard, B. (1993). The impact of corporate pollution on market valuation: some empirical evidence. *Ecological Economics*, 8, 135-155.

Chen, K. H., & Metcalf, R. W. (1980). The relationship between pollution control record and financial indicators revisited. *The accounting review*, 55, 168-177.

Christmann, P. (2000). Effects of "Best Practices" of environmental management on cost advantage: the role of complementary assets. *Academy of Management Journal*, 43, 663-680.

Davis, J. J. (1991). A blueprint for green marketing. *Journal of Business Strategy*, 12 (4), 14-17.

Derwall, J., Guenster, N., Bauer, R., & Koedijk, K. (2005). The eco-efficiency premium puzzle. *Financial Analysts Journal*, 61 (2), 51-63.

Dodds, R., & Joppe, M. (2005). *CSR in the tourism industry? The status of and potential for certification, codes of conduct and guidelines*. I. C. Department, International Finance Corporation, World Bank Group.

Dowell, G., Hart, S., & Yeung, B. (2000). Do corporate global environmental standards create or destroy market value? *Management Science*, 46, 1059-1074.

Enz, C. A., & Siguaw, J. A. (1999). Best hotel environmental practices. *Cornell Hotel and Restaurant Administration Quarterly*, 40 (5), 72-77.

Foster, T. S. J., Sampson, S. E., & Dunn, S. C. (2000). The impact of customer contact on environmental initiatives for service firms. *International Journal of Operations & Production Management*, 20, 197-203.

Frey, B., & Jegen, R. (2001). Motivation crowding theory. *Journal of Economic Surveys*, 15, 589-611.

Gallouj, F., & Weinstein, O. (1997). Innovation in services. *Research Policy*, 26, 537-556.

González, M., León, C., & Padrón, N. (2006). Obsolescencia y políticas de renovación medioambiental en el sector turístico. *Cuadernos Económicos del ICE*, 71, 153-176.

González, M., & León, C. J. (2001). The adoption of environmental innovations in the hotel industry of Gran Canaria. *Tourism Economics*, 7, 117-190.

Goodman, A. (2000). Implementing sustainability in service operations at Scandic hotels. *Interfaces*, 30, 202-214.

Green, H., Hunter, C., & Moore, B. (1990). Assessing the environmental impact of tourism development. Use of the Delphi technique. *Tourism Management*, 11, 111-120.

Grove, S. J., Fisk, R. P., Pickett, G. M., & Kangun, N. (1996). Going green in the service sector: Social responsibility issues, implications and implementation. *European Journal of Marketing*, 30 (5), 56-66.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 163, 1243-1248.

Hardy, A., & Beeton, R. J. S. (2001). Sustainable tourism or maintainable tourism: Managing resources for more than average outcomes. *Journal of Sustainable Tourism*, 9, 168-192.

Hart, S. L., & Ahuja, G. (1996). Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance. *Business Strategy and the Environment*, 5, 30-37.

Hassan, S. H. (2000). Determinants of market competitiveness in an environmentally sustainable tourism industry. *Journal of Travel Research*, 38, 239-245.

Healy, R. (1994). The "common pool" problem in tourism landscapes. *Annals of Tourism Research*, 21, 596-611.

Heskett, J. L., Jones, T. O., Loveman, G. W., Sasser, W. E., & Schlesinger, L. A. (1994). Putting the service-profit chain to work. *Harvard Business Review*, 72 (2), 164-175.

Hjalager, A. (1996). Tourism and the environment: The innovation connection. *Journal of Sustainable Tourism*, 4, 201-218.

Hunter-Jones, P. (1997). Sustainable Tourism. *Annals of Tourism Research*, 24, 477-478.

Huybers, T., & Bennett, F. (2002a). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2002b). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2003). Environmental management and the competitiveness of nature-based tourism destinations. *Environmental and Resource Economics*, 24, 213-233.

Jaggi, B., & Freedman, M. (1982). An analysis of the informational content of pollution disclosures. *The financial review*, 17, 142-152.

Jamal, T., & Getz, D. (1995). Collaboration theory and community tourism planning. *Annals of Tourism Research*, 22, 186-204.

Joppe, M. (1996). Sustainable community tourism development revisited. *Tourism Management*, 17, 475-479.

Judge, W., & Douglas, T. J. (1998). Performance implications of incorporating natural environmental issues into the strategic planning process: An empirical assessment. *Journal of Management Studies*, 35, 241-262.

Kassinis, G., & Soteriou, A. (2005). Greening service organizations: environmental management practices and performance. In S. Sharma, & J. Aragón (Eds.), *Corporate environmental strategy and competitive advantage* (pp. 115-138). Cheltenham: Edward Elgar.

Kassinis, G. I., & Soteriou, A. C. (2003). Greening the service profit chain: The impact of environmental management practices. *Production and Operations Management*, 12, 386-402.

Khanna, M. (2001). Non-mandatory approaches to environmental protection. *Journal of Economic Surveys*, 15, 291-324.

King, A. A., & Lenox, M. J. (2002). Exploring the locus of profitable pollution reduction. *Management Science*, 48, 289-299.

Kirk, D. (1998). Attitudes to environmental management held by a group of hotel managers in Edinburg. *Hospitality Management*, 17, 33-47.

Klassen, R. D., & Whybark, C. D. (1999). The impact of environmental technologies on manufacturing performance. *Academy of Management Journal*, 42, 599-615.

Knowles, T., & Curtis, S. (1999). The market viability of European mass tourist destinations. A post-stagnation life-cycle analysis. *International Journal of Tourism Research*, 1, 87-96.

Konar, S., & Cohen, M. A. (2001). Does the market value environmental performance? *The Review of Economics and Statistics*, 83, 281-289.

Kousis, M. (2000). Tourism and the environment: A social movement perspective. *Annals of Tourism Research*, 27, 468-489.

Kuvan, Y., & Akan, P. (2005). Residents' attitudes toward general and forest-related impacts of tourism: The case of Belek, Antaya. *Tourism Management*, 26, 691-706.

Liu, J., Dietz, T., Carpenter, S. R., Alberti, M., Folke, C., Moran, E., Pell, A. N., Deadman, P., Kratz, T., Lubchenco, J., Ostrom, E., Ouyang, Z., Provencher, W., Redman, C. L., Schneider, S. H., & Taylor, W. W. (2007). Complexity of coupled human and natural systems. *Science*, 317, 1513-1516.

Liu, J., Sheldon, P. J., & Var, T. (1987). Resident perceptions of the environmental impacts of tourism. *Annals of Tourism Research*, 14, 17-37.

Livernois, J., & McKenna, C. J. (1999). Truth or consequences. Enforcing pollution standards with self-reporting. *Journal of Public Economics*, 71, 415-440.

Mahapatra, S. (1984). Investor reaction to a corporate social accounting. *Journal of Business Finance and Accounting*, 11, 29-40.

Marshall, G. R. (2005). *Economics for collaborative environmental management: Renegotiating the commons*. Sterling: Earthscan.

McGinnis, M. (2000). *Polycentric games and institutions: readings from the Workshop in Political Theory and Policy Analysis*. Ann Arbor: University of Michigan Press.

Morgan, M. (1991). Dressing up to survive: Marketing Majorca anew. *Tourism Management*, 12, 15-20.

Moutinho, L. (2000). Trends in tourism. In L. Moutinho (Ed.), *Strategic management in tourism* (pp. 3-16). Wallingford: CABI Publishing.

Nehrt, C. (1996). Timing and intensity effects of environmental investments. *Strategic Management Journal*, 17, 535-547.

Orfila-Sintes, F., Crespí-Cladera, R., & Martínez-Ros, E. (2005). Innovation activity in the hotel industry: Evidence from Balearic Islands. *Tourism Management*, 26, 851-865.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action* (17th ed.). New York: Cambridge University Press.

Ostrom, E. (2000). Crowding out citizenship. *Scandinavian Political Studies*, 23, 3-16.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. *PNAS*, 104, 15181-15187.

Ostrom, E., Gardner, R., & Walker, J. (1994a). *Rules, games and common pool resources* (7th ed.). Ann Arbor: University of Michigan Press.

Ostrom, E., Gardner, R., & Walker, J. (1994b). *Rules, games and common pool resources* (7th ed.). Ann Arbor: University of Michigan Press.

Ostrom, E., Janssen, M., & Anderies, J. (2007). Going beyond panaceas. *PNAS*, 104 (39), 15176-15178.

Parra, E., García, F. J., & Guitiérrez, D. (2004). Importance of environmental resources and capabilities for firm's competitiveness. The case of the hotel industry in the Canary Islands. *Anatolia*, 15, 183-199.

PATA. (2007). *Asia Travel Intentions Survey. April 2007*. Pacific Asian Travel Association.

Pintassilgo, P., & Albino, J. (2007). "Tragedy of the commons" in the tourism accommodation industry. *Tourism Economics*, 13, 209-224.

Poon, A. (1994). The "new tourism" revolution. *Tourism Management*, 15, 91-92.

Rege, M. (2000). Strategic policy and environmental quality. *Environmental and Resource Economics*, 15, 279-296.

Rennings, K., Schröder, M., & Ziegler, A. (2003). The economic performance of European stock corporations. *Greener Management International* (44), 33-43.

Rennings, K., Ziegler, A., Ankele, K., & Hoffmann, E. (2006). The influence of different characteristics of the EU environmental management and auditing scheme on technological environmental innovations and economic performance. *Ecological Economics*, 57, 45-59.

Rhodes, R. (1996). The new governance: Governing without government. *Political Studies*, 44, 652-667.

Ritchie, B., & Crouch, G. (2000). The competitive destination: A sustainability perspective. *Tourism Management*, 21, 1-7.

Ritchie, B., & Crouch, G. (2003). *The competitive destination: a sustainable tourism perspective*. Wallingford: CABI Publishing.

Rivera, J. (2002). Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences*, 35, 333-360.

Rivera, J. (2004). Institutional pressures and voluntary environmental behavior in developing countries: Evidence from the Costa Rican hotel industry. *Society and Natural Resources*, 17, 779-797.

Russo, M. V., & Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance and profitability. *The Academy of Management Journal*, 40, 534-559.

Sinclair, T., & Stabler, M. (1997). *The economics of tourism*. London: Routledge.

Spicer, B. H. (1978). Investors, corporate social performance and information disclosure: An empirical study. *The accounting review*, 53, 94-111.

Thomas, A. (2001). Corporate environmental policy and abnormal stock price returns: An empirical investigation. *Business Strategy and the Environment*, 10, 125-134.

Timothy, D. (1999). Participatory planning: A view of tourism in Indonesia. *Annals of Tourism Research*, 26, 371-391.

Wagner, M., Van Phu, N., Azomahou, T., & Wehrmeyer, W. (2002). The relationship between the environmental and economic performance of firms: An empirical analysis of the European paper industry. *Corporate Social Responsibility and Environmental Management*, 9, 133-146.

WTO (1999). *Sustainable development of Tourism: An annotated bibliography*. Madrid: World Tourism Organization.

WTO (2001). *Public-Private Sector Cooperation: Enhancing Tourism Competitiveness.* Madrid: World Tourism Organization.

WTO (2002). *Voluntary initiatives for sustainable tourism: Worldwide inventory and comparative analysis of 104 eco-labels, awards and self-commitments*. Madrid, Spain: WTO.

WTO (2004). *Indicators of Sustainable Development for Tourism Destinations: A Guidebook.* Madrid: World Tourism Organization.

Yamahita, M., Sen, S., & Roberts, M. C. (1999). The rewards for environmental conscientiousness in the U.S. capital markets. *Journal of Financial and Strategic Decisions*, 12 (1), 73-82.

Chapter 4: Imperfect regulation and environmental behavior of recreational users of natural resources

4.1. Introduction

Improvements in living conditions and the development of environmental consciousness have popularized recreational uses of natural resources. In many regions, these recreational uses of nature are related to tourism. In nature-based tourism areas, recreational resource usage by tourism operators partially substitutes for traditional extractive uses. In these areas, environmental quality constitutes a relevant competitiveness factor (Goeldner & Ritchie, 2003; Huybers & Bennett, 2002a; Ritchie & Crouch, 2000). Environmental quality influences the selection of which region to visit (Alegre & Pou, 2003; Stonich, 1998; WTO, 2004), satisfaction derived from the experience (Alegre & Cladera, 2006; Kassinis & Soteriou, 2005; Kassinis & Soteriou, 2003), and the price visitors pay for tourism products (Alegre & Juaneda, 2006; Dodds & Joppe, 2005; Huybers & Bennett, 2002b; Kassinis et al., 2005; Kassinis et al., 2003; PATA, 2007; Rivera, 2002). However, as regions become more popular, industry-derived pressures can lead to declines in environmental quality and constrain future developments (Butler, 1980; WTO, 2004). Tourism expansion is generally described as accompanied by congestion, degradation of natural assets, weak management of waste and effluents, and various other negative impacts (for some examples see Knowles & Curtis, 1999; Morgan, 1991; Tisdell, 2001). Therefore, the tourism industry has a two-fold relation with natural assets, characterized by simultaneous dependency and impact.

Recently, in the regulatory context (mostly driven by command and control mandates), environmental prescriptions aimed at reducing pressures on natural resources by the tourism industry emphasize the role of voluntary initiatives. Non-mandatory approaches to environmental protection include a diverse set of efforts that can be classified into three broad categories: public voluntary programs created by regulators, negotiated agreements between a firm or an industry and the regulator, and unilateral commitments by firms (an extensive description of each of these categories can be found in Khanna, 2001). For the purposes of this study, we focus on the latter. This includes environmental codes of conduct and other uncertified environmental practices (Mihalic, 2000). Some of the activities undertaken when developing unilateral commitments in tourism are energy, water and waste savings, technological and organizational practices on pollution prevention and control, ecological purchasing, staff environmental training, and customer education (Álvarez, Burgos, & Céspedes, 2001; Carmona-Moreno, Céspedes-Lorente, & de Burgos-Jimenez, 2004; Claver-Cortés, Molina-Azoín, Pereira-

Moliner, & López-Gamero, 2007; Kassinis et al., 2003; Rivera, 2002). In addition, firms can undertake investments for environmental protection in a broader sense to attempt to improve the status of an already degraded environment. This would include, for example, a hotel improving the quality of a nearby tropical forest, a rafting company cleaning a nearby river, etc.

These voluntary initiatives by firms have a complex relationship with public intervention. Some literature considers public intervention still necessary, despite the potential usefulness of voluntary initiatives Marshall (2005) and Andrews (1998) argue that self-regulation by users should not be understood as eliminating any role for the state. Further, Buckley (2002) and Rivera (2002) defend a potential crowding-in, i.e., that voluntary initiatives are most effective if used alongside other environmental management tools, including legislation and regulations. However, there is also evidence that strongly supports the emergence of crowding-out in some situations, i.e., when public intervention weakens some of the motivations supporting voluntary initiatives (Andrews, 1998; Frey & Jegen, 2001; Khanna, 2001; Ostrom, 2000; Rivera, 2002, 2004). This crowding-out can interact with other policy failures, as in the use of command-and-control instruments, corruption, and imperfect monitoring, giving rise to negative environmental consequences as a result of regulation.

This chapter analyzes how public intervention changes incentives for undertaking environmental contributions by tourism firms that make use of a natural common-pool resource (CPR). This might refer to a group of firms that provide services (either lodging, catering, or others) to tourists who make recreational use of a piece of shoreline, diving area, lake, river, piece of forest land, or wildlife and ski areas, all of which have been previously described as CPRs in the tourism literature (Healy, 1994; Imperial, 1999).

Our baseline is a game-theoretical model that extends Blanco et al. (2009), where firms can undertake unilateral commitments as a result of non-monetary motivations, market incentives, or a combination of the two. Non-monetary motivations can emerge as a result of informal institutions related to shared strategies (personal attachment to the region) or norms of behavior (informal social benefits from other members of the community upon observing an agreed behavior) (empirical evidence in the tourism literature can be found in Sirakaya, 1997; Sirakaya & Uysal, 1997). Market incentives emerge when we consider that a firm's environmental expenditures may provide it with a competitive advantage, as in industrial economics (Amacher, Koskela, & Ollikainen, 2004; Arora & Gangopadhyay, 1995; Conrad, 2005; Moraga-González & Padrón-Fumero, 2002). Similarly, environmental investments improve environmental quality as a non-excludable good, positively affecting the profits of all firms, as in the tourism literature (Calveras, 2003, 2007; Calveras & Vera-Hernández, 2005; Candela & Cellini, 2006; Gómez, Lozano, & Rey-Maquieira, 2008; Pintassilgo & Albino, 2007). Other extensions from previous contributions are to allow for potential asymmetry of firms and to address firms' strategic environmental behavior within a destina-

tion instead of competition between destinations based on environmental concerns.

Then, we extend the open access game by including a formal institution in the form of an environmental standard imposed by the government. The model assumes that public intervention crowds-out voluntary initiatives, potentially reducing environmental contributions by firms, consistent with some empirical evidence. Further, we allow for the existence of corruption in the form of bribery of inspectors, as inspired by Wilson and Damania (2005). Comparing results in the public intervention game with that of the open access game, we identify conditions under which command-and-control imposition can lead to lower levels of environmental contribution by tourism firms. Results first demonstrate the intuitive finding that when undercompliance costs are lower than non-monetary motivations, regulation might result in lower environmental quality. Second, a more complex result is obtained that shows that when premiums from bribery in a corrupt environment are sufficiently high, so as to neutralize incentives towards "green" differentiation, the strategic behavior of firms change, and they follow pooling strategies and extreme equilibria in their environmental abatement.

The structure of the rest of the chapter is as follows: Section 4.2 presents some stylized facts on the management of recreational CPRs extracted from the empirical evidence. Next, section 4.3 develops the model for firms' voluntary environmental initiatives under an open access situation. The open access model is extended in section 4.4 to introduce the imposition of an environmental standard. In section 4.5, we show that part of the results from prior sections might stand in certain contexts, even when relaxing our model's basic assumptions. Lastly, section 4.6 concludes and highlights some policy implications.

4.2. Management of recreational uses of natural CPRs

Several motivations to undertake unilateral commitments are considered by the literature. Still, public intervention on natural CPR usage is defended. When defending such interventions, there are generally two factors that are neglected: crowding-out of non-monetary motivational aspects and the difficulty associated with correct monitoring of compliance.

4.2.1. Motivations to undertake unilateral commitments

There is a wide body of literature analyzing firms' incentives for undertaking voluntary environmental initiatives (Brau & Carraro, 2004; Khanna, 2001; Lyon & Maxwell, 2002, 2008; Portney, 2008 review this literature). Economic motivations have been previously considered in the literature. Some of these economic motives

are regulatory gains, demand effects, costs efficiency, and technical assistance (Amacher et al., 2004; Anton, Deltas, & Khanna, 2004; Arora et al., 1995; Brau et al., 2004; Khanna, 2001; Lyon et al., 2002, 2008; Portney, 2008; Vidovic & Khanna, 2007; Vidreras & Alberini, 2000). We focus on demand effects[1], since these are the economic incentives with greater empirical support in the tourism literature (Álvarez et al., 2001; Carmona-Moreno et al., 2004; Claver-Cortés et al., 2007; Kassinis et al., 2003; Rivera, 2002). The empirical literature on the relationship between tourism firms' environmental and economic performance shows consistent, though partial, evidence for the hypothesis that it pays to be green (Blanco et al., 2009).

In addition, non-monetary motivations have also been modeled in previous literature (e.g., Crawford & Ostrom, 1995; Osés & Viladrich, 2007; Sethi & Somanathan, 1996). These motivations are considered under the assumption that, in an unregulated context, users of natural CPRs might (i) show intrinsic motivation and/or (ii) be subject to informal social benefits derived from following behavioral norms or shared strategies among users (Cardenas & Ostrom, 2004).

According to Motivational Crowding Theory (Frey et al., 2001), agents are considered intrinsically motivated to perform an activity when they receive no apparent reward except performing the activity itself (Deci, 1971). In a game theoretic context, this is translated into certain players' behavior being partially based on preferences related to how they prefer to behave (disregarding monetary outcomes) and the outcomes they whish to obtain for themselves and possibly others (Ostrom, 2005). Empirical research on the tourism industry shows that firms' environmental strategies are influenced by their perceived responsibility in addressing environmental problems (Dewhurst & Thomas, 2003; Sirakaya, 1997; Sirakaya et al., 1997), supporting some intrinsic motivation. In addition, norms of behavior or shared strategies in a community can lead to non-monetary motivations. Following certain agreed upon behaviors for the management of a natural CPR can be positively recognized by other community members who use that resource, entitling that user to become part of a group and receive certain privileges as a result[2] (Osés et al., 2007; Tarui, Mason, Polansky, & Ellis, 2008).

Some types of tourism operators may be especially influenced by non-monetary motivations, such as local owners of firms (Brohman, 1996; Duffy, 2000; Kusluvan & Karamustafa, 2001; Sekhar, 2003) and small operators (Dewhurst et al., 2003).

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[1] Literature on demand effects analyze the market implications of product differentiation when consumers are concerned about environmental aspects of a good or service (Amacher et al., 2004; Arora et al., 1995; Conrad, 2005; Ibanez & Grolleau, 2008; Moraga-González et al., 2002; Sedjo & Swallow, 2002).

[2] Users can receive from that group (Osés et al., 2007): social inclusion and public consideration, everyday favors and signs of approval that make life easier and more pleasant, moral support in difficult circumstances, and certain bestowals and positions.

4.2.2. Crowding-out of non-monetary motivational factors

Non-monetary motivational factors are not independent from the institutional setting in which agents are embedded. When the voluntary character of environmental investments is replaced by regulated obligations, intrinsic motivation and/or informal group-oriented motivations might be reduced and eventually dissipated. In general, the literature suggests that external intervention crowds out intrinsic motivation if the affected individuals perceive it to be controlling[3]. According to Ostrom (2000), much contemporary policy analysis and the policies adopted in many modern democracies crowd-out endogenous cooperative behavior. Consistent with this view, the review by Frey and Jegen (2001) presents several laboratory and field experiments demonstrating crowding-out effects of external environmental intervention. Examples of these effects are increased egoistic behavior by forest users after a regulatory approach is imposed (Cardenas, Strandlund, & Willis, 2000) and greater compliance with pollution standards that have lower fines for noncompliance (Livernois & McKenna, 1999). In the tourism industry, public intervention has been shown to focus on planning and restriction, precluding the proactive environmental behavior of firms (Dewhurst et al., 2003). Thus, a resultant crowding-out seems reasonable.

4.2.3. Imperfect monitoring of compliance

We consider two main sources of imperfect monitoring: corruption and imperfect detection rates by environmental inspectors.

Corruption is considered one of the main sources of environmental damage in developing countries (Damania, 2002; Wilson et al., 2005). The World Bank (Anderson & Gray, 2006) has found that natural-resource-exporting countries[4] in the transitional economies of Europe and Central Asia tend on average to have higher levels of corruption than countries with a more diversified export base.

Most studies addressing corruption focus on "state capture" corruption (Dawson & Segerson, 2008; Glachant, 2007; Manzini & Mariotti, 2003; Segerson & Miceli, 1998; World_Bank, 2000), where payments are made in order to influence the setting of a policy parameter. Here, as in Damania (2002) and Wilson and

[3] However, it could also be the case that exogenous institutions crowd in intrinsic motivation. This would be the case if the individuals concerned perceive it as supportive (Frey et al., 2001),. That is, self-esteem is fostered and individuals feel that they are given more freedom to act, enlarging their self-determination. Empirical results in Costa Rica by Rivera (2004) provide a good example of potential crowding-in. For the purposes of this research, regulatory intervention is assumed to crowd out voluntary action.

[4] Nature-based tourism regions serving an international tourism demand can be considered nature-exporting regions.

Damania (2005), we address less explored "administrative corruption" that involves bribery, thereby distorting the implementation of existing regulation. Bribery of environmental inspectors has been reported as a frequent activity by approximately 5% of firms in the World Bank survey of transitional economies (Anderson et al., 2006) and seems important in some tourism contexts. For instance, in Belize, bribery of government officials has resulted in the inability of the formal state to enforce environmental legislation in the ecotourism industry (Duffy, 2000). Similarly, corruption at various levels of government in Rajastan, India, makes it convenient for private agencies to ignore environmental regulations related to wildlife tourism (Sekhar, 2003). In another Indian region, in Goa, the incapacity of the government to control building along the coastal strip has been attributed to its inefficiency and corruption, resulting in a haphazard and uncontrolled development (Wilson, 1997).

A second source of imperfection in monitoring stems from the limited capacity of detection by inspectors. This may be especially important in the case of recreational uses of resources, where environmental impacts are softer and more diffuse as compared to the impacts resulting from extractive uses. Recreational users might be spread out over a resource, which can be large and difficult to observe. In addition, the type of activities undertaken by users might entail low unitary pressures (whilst aggregate impacts might potentially compromise a resource's maintenance). Observing infractions of regulations and being capable of attributing an infraction to a particular user might be a difficult task. Some examples include tropical forest excursions for seeking biodiversity experiences or boat trips to coral reefs for scuba diving.

4.3. The model for open access

Our model considers a fixed number, *N,* of firms that provide tourism services linked to the use of a natural CPR. These firms are potentially asymmetric, hold complete information, and undertake single, simultaneous, and independent decisions about environmental strategies. Available strategies for each player are whether or not to undertake unilateral commitments to reduce derived environmental damage by the most appropriate means. Similar to Osés and Viladrich (2007), we assume that abatement of environmental damage by each firm, $i \in N$, can be represented by means of a dichotomous variable $a^i \in \{a^g, a^{ng}\}$, where a^g corresponds to firms' voluntarily undertaking abatement efforts beyond compliance, and a^{ng} corresponds to firms only complying with regulation ($a^{ng}<a^g$). We refer to agents choosing a^g as "green" firms and agents choosing a^{ng} as non-green firms. For simplicity, we normalize $a^{ng}=0$. The N firms in the destination make use of a common-pool natural resource, over which firms exercise pressures according to the total damage function $D(n^g) = d\left[N - a^g \cdot n^g\right]$. Where d represents the uni-

tary environmental damage by tourism firms over the natural CPR, we normalize this to d=1 for simplicity. We assume a given stock of the natural resource, $\overline{K}$, which jointly with the damage function determines the natural capital function $K(n^g) = \overline{K} - d\left[N - a^g \cdot n^g\right]$ that positively depends on the number of green firms in the region, $\partial K(n^g) \big/ \partial n^g > 0$. Environmental action ($a^i = a^g$) is open to two different interpretations, either more efficient usage of natural inputs or direct investments to improve the quality of natural CPRs. We assume that payoffs depend on the selected environmental strategy, and that the payoffs may be asymmetric in the sense that the benefits and costs functions can differ for each player.

Consistent with evidence found by Kassinis and Soteriou (2003), this contingency of payoffs from environmental strategies does not derive from cost effects, but is motivated by a demand effect that generates a competitive/comparative advantage for firms that undertake unilateral commitments. Specifically, following evidence from Rivera (2002), Hubers et al. (2002b), and the Asia Travel Intentions Survey (2007), this advantage is reflected in increased prices. Therefore, we assume that the price for tourism services is equal to:

$$P_i = x + \delta_i(n^g_{-i}) \cdot g_i + \gamma_i(n^g) \text{ , for } \forall n^g \geq 0 \text{ and } \forall n^g_{-i} \geq 0, \tag{4.1}$$

where x is a part of the price that is independent of environmental actions and g_i. is a dummy variable representing the profile of actions by firms, which is equal to 1 for green firms, and 0 for non-green firms. Minimum attributes to define $\delta(n^g_{-i})$ and $\gamma(n^g)$ are,

$$\delta_i(n^g_{-i}) = \begin{cases} z_i \geq 0 & \text{if } n^g_{-i} = 0 \\ 0 \leq \delta(\cdot) \leq z_i & \text{if } 0 < n^g_{-i} < N-1 \\ 0 & \text{if } n^g_{-i} = N-1 \end{cases} \text{, and } \frac{d\delta_i(\cdot)}{d(n^g_{-i})} < 0$$

$$\gamma_i(n^g) = 0 \qquad \text{if } n^g = 0 \qquad \text{, and } \frac{d\gamma_i(\cdot)}{d(n^g)} \geq 0$$

These indicate that, when player i undertakes unilateral commitments, a firm is capable of charging an extra price, $\delta_i(\cdot)$, with respect to other firms at the destination due to its environmental differentiation. This $\delta_i(\cdot)$ differential is always positive for firms improving their environmental performance and diminishes with the number (n^g_{-i}) of other firms at the tourism destination undertaking unilateral commitments. In addition, environmental initiatives by player i might increase the quality of the natural CPR that is part of the tourism experience, with a positive effect on tourism prices. Due to the non-excludability of the natural CPR, other firms may also take advantage of this positive effect. Then, all tourism firms using that natural resource may charge extra, $\gamma_i(\cdot)$, for their products with respect to

other tourism products of firms at different destinations. In sum, as in previous work (Cerina, 2007; Gómez et al., 2008; Lozano, Gómez, & Rey-Maquieira, 2008; Piga, 2003; Rey-Maquieira, Lozano, & Gómez, 2005), we assume that willingness to pay for tourism services linked to natural resources depend on environmental attributes.

Price equation 4.1 influences firms' payoffs insofar as it affects obtained profits. In addition to profits, payoffs also include motivational preferences, as explained in section 4.2.1. These are included in the β_i parameter of the following payoff function:

$$U_i = q_i\left[x + \delta_i(n^g_{-i}) \cdot g_i + \gamma_i(n^g)\right] - c_i \cdot g_i - co + \beta_i \cdot g_i \quad \text{,for } \beta_i \geq 0, \qquad (4.2)$$

where q_i is the quantity produced by the i-th firm, c_i is the cost of undertaking the environmental initiatives, and co are other costs that are independent of environmental behavior. This specification shows that only firms undertaking unilateral commitments (g_i=1) incur environmentally-related costs (c_i), which will be specific to each firm, and obtain non-monetary rewards (β_i). Given equation 4.2, asymmetries can arise from differences in $\delta_i(\cdot)$, $\gamma_i(\cdot)$, c_i, and β_i (we rule out asymmetries in x and co).

In order to avoid complications resulting from the asymmetry assumption in an N dimensional system (Ostrom, Gardner, & Walker, 1994), dimensions of the game are reduced to two players in analyzing possible equilibria. A normal form representation of two representative players is presented in figure 1. The first row in the cell corresponds to player 1 and the second row corresponds to player 2. Payoffs when no firms undertake unilateral commitments have been normalized to (0,0). For simplicity, it is assumed that each player produces one unit of output. Furthermore, to reduce the complexity of the notation, a simple linear functional form has been used to represent the effect of $\gamma_i(\cdot)$, $\gamma_i(n^g) = \gamma_i \cdot n^g$, $\gamma_i \geq 0$.

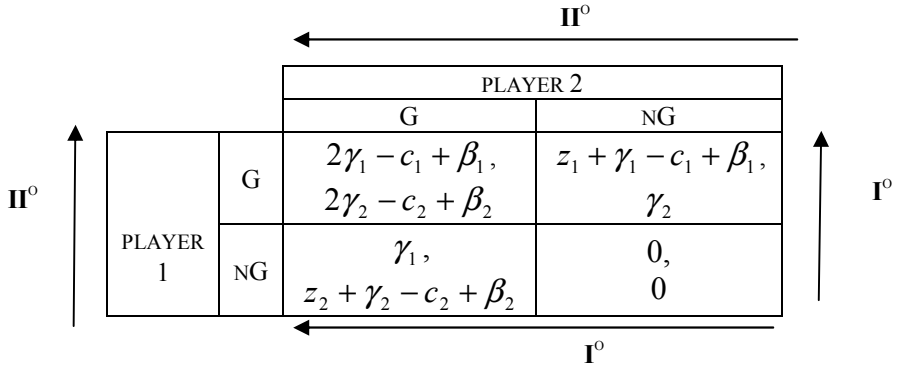

Fig. 4.1. Normal form representation of unilateral commitments in open access.

Conditions I^0 and II^0 are depicted by arrows in figure 1, and the lines in figure 2 (dots representing condition I and triangles condition II) determine firms' strategies.

Condition I^0: $c_i < \gamma_i + z_i + \beta_i$ for *i*=1 and/or 2

Condition II^0: $c_i < \gamma_i + \beta_i$ for *i*= 1 and 2

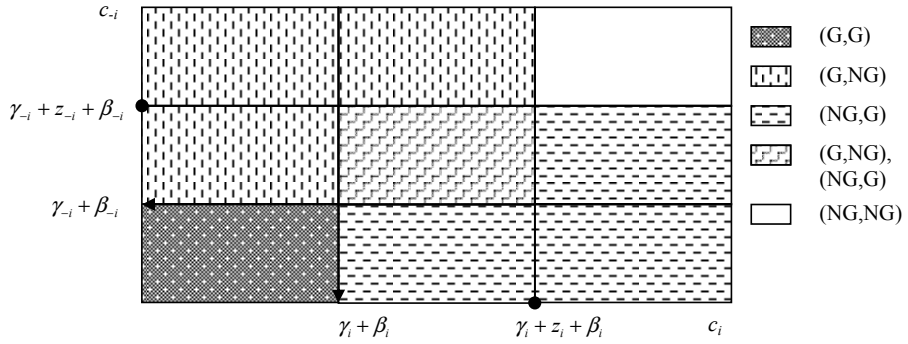

Fig. 4.2. Equilibrium diagram illustrating the parameter regimes for different types of Nash equilibria in the game of unilateral commitments in open access.

Lemma 1: *A necessary and sufficient condition for at least one firm to undertake unilateral commitments in equilibrium is that* $c_i < \gamma_i + z_i + \beta_i$ *for i=1 and/or 2.*

According to lemma 1, there are combinations of parameter values capable of avoiding a tragedy equilibrium. These are represented by the shadowed areas in figure 2, where possible equilibriums are represented as a function of the values of parameter c_i, i=1,2 (horizontal axis for player i and vertical axis for player $-i$) given the values of the rest of the parameters. When lemma 1 holds, the competitiveness improvement stemming from the environmental actions that firm i undertakes to differentiate itself from other firms at the destination (generating $\delta_i(\cdot)$ and $\gamma_i(\cdot)$ price premiums), jointly with its non-economic motivation, compensate for implementation costs.

Lemma 2: *A necessary and sufficient condition to guarantee full cooperation in the equilibrium is that* $c_i < \gamma_i + \beta_i$ *for i= 1 and 2.*

Lemma 2, establishes that price increases for firm i that result from green behavior that does not contribute to differentiation (when both firms undertake envi-

ronmental investments and therefore only generate a $\gamma_i(\cdot)$ effect), jointly with non-monetary rewards, still compensate for the extra costs. It can be easily shown that all values of abatement costs meeting condition II^0 also meet condition I^0. Consequently, lemma 2 implies that both firm 1 and firm 2 follow dominant green strategies. Combinations of abatement costs that lead both firms to undertake abatement activities are represented by the darkest shadowed area in figure 2.

Empirical evidence (Kassinis et al., 2003; Parra, García, & Guitiérrez, 2004; Rivera, 2002) shows that those firms undertaking unilateral commitments perform better in pure economic terms (without considering non-economic motivations) than those that do not. In our game setting, this would imply that $z_i + \gamma_i - c_i > \gamma_{-i}$ for i=1 and/or 2. That is, extra profits from environmental actions that accrue to green firms are higher than non-green firms' gains from free riding behavior. Therefore, the empirical evidence shows that condition I^O is a reasonable possibility for at least one of the firms[5]. Still, we do not restrict the analysis to the equilibria where condition I^0 holds, instead considering all possible configurations of equilibria.

4.4. The model for Public Intervention

This section aims to evaluate repercussions on tourism firms' environmental behavior resulting from public intervention. We do not explicitly model the government's decision process, but rather assume that several failures characterize policy action, namely, incomplete information, corruption, and lack of access to market-based environmental policy tools. For comparability with section 4.3, let us assume that the government introduces an environmental standard that requires firms to undertake environmental investments in order to achieve an abatement level equal to a^g, otherwise a fine f will be imposed[6]. As in Damania (2002), the regulator cannot directly observe the behavior of firms. Consequently, the introduction of the standard forces the government to include a new player into the game, an environmental inspector that monitors firms' environmental behavior. For simplicity and realistic description, the inspector receives a fixed wage from

[5] If $z_i + \gamma_i - c_i > \gamma_{-i}$, taking into consideration that $\gamma_{-i} \geq 0$; then, necessarily, $z_i + \gamma_i - c_i > 0$ and therefore $z_i + \gamma_i + \beta_i - c_i > 0$. Note that all of these considerations stand for values where β_i=0. The transformation of the game to include non-economic motivations reinforces the validity of non-tragedy outcomes as it expands the range of values for abatement costs that firms voluntarily contribute to environmental conservation.

[6] This could be the decision of an incompletely informed government that observes that, under open access, firms that undertake unilateral commitments perform better in economic and environmental terms than do other firms. If the government does not perceive potential crowding out and strategic interactions, it may expect that social benefits will increase under the described environmental standard.

the regulator. After incorporating costs of monitoring and the opportunity costs of alternative tasks, the net wage w to the inspector is assumed to be positive. Monitoring efforts by the inspector result in an imperfect detection rate, as is habitual and realistic to assume, where $\alpha \in (0,1)$ denotes the probability of detection. Furthermore, we allow the inspector to become corrupt as inspired by Wilson and Damania's (2005) principal-agent model of administrative corruption. We consider corruption embodied in obtaining individualized exceptions or favorable application of regulations for firms through bribery of inspectors.

The resulting game is as follows: in the fist step, each firm decides whether to comply or not with the environmental standard in a situation where, as explained in section 4.2.1, non-monetary motivations are no longer present[7]. In the second step, firms that have undercomplied with the standard can simultaneously and independently offer a bribe (B_i) to the inspector to induce her to pass over their respective sanction, or otherwise face a specific expected fine. In the third step, the inspector can either accept bribes and not monitor bribing firms, or reject becoming corrupt and monitor as usual[8]. Finally, in the fourth step, the government commissions an audit to deter non-compliance. In the case of an audit, with a certain probability λ, corruption is uncovered and leads to a successful prosecution of bribing firms and the inspector with penalties p and P, respectively[9].

Solving by backward induction, in the fourth step, nature operates and determines with probability λ the detection of corruption. In the third step, the inspector is ready to accept a bribe when she expects a positive gain from corrupt behavior. The inspector compares its expected payoffs from accepting bribes (the term inside square brackets in equation 4.3) with its payoff aside of corruption (w)[10].

$$\psi^m = \left[w + \sum_i B_i - P^e \right] - w, \qquad \text{for } B_i \geq 0 \text{ and } P^e = \lambda P \tag{4.3}$$

[7] Insofar as the standard may reduce flexibility in choosing abatement techniques, public intervention may increase costs per unit of abatement (Dawson et al., 2008; Johnston, 2005). In our model, this effect would only strengthen the effect derived from the opportunity costs of losing β_i. Therefore, for simplicity, we opt to follow Segerson & Miceli (1998) and consider that the cost function is the same under both open access and regulated settings.

[8] It is assumed that bribing behavior cannot be used by the inspector as a signal of firms' environmental compliance and, therefore, in the case of rejection of an offered bribe, a firm faces the same expected fine as if no bribe was offered (monitoring intensity does not change).

[9] According to Wilson and Damania (2005), the probability of successful prosecution after an audit is initiated (λ) captures (i) the ability of the policy maker to detect cheating and (ii) the ability of the legal system to convict guilty offenders, i.e., the efficiency of the judiciary.

[10] We assume for simplicity that prosecution of corruption by the government has a side effect on the behavior of the inspector. Aimed at reducing the probability of detection, the inspector incurs time and effort costs when pretending she is monitoring. As a consequence, monitoring costs, w, do not change when corrupt behavior emerges.

Becoming corrupt results in positive gains for the inspector ($\Psi^m>0$) whenever bribing income is higher than the expected value of punishment for illegal behavior ($\sum B_i > P^e$).

In the second step, firms that have undercomplied with the environmental regulation in the first step decide whether or not to try to corrupt inspectors. The utility function for firms when being corrupt (k_i=1) and when not being corrupt (k_i=0) is expressed in equation 4.4:

$$\pi_i = \left.\begin{cases} if\ k_i = 1 & q_i\left[x + \delta_i(n^g_{-i}) \cdot g_i + \gamma_i(n^g)\right] - c_i \cdot g_i - co - (B_i + p^e) \cdot (1 - g_i) \\ if\ k_i = 0 & q_i\left[x + \delta_i(n^g_{-i}) \cdot g_i + \gamma_i(n^g)\right] - c_i \cdot g_i - co - f^e \cdot (1 - g_i) \end{cases}\right\} \tag{4.4}$$

where $p^e = \lambda p$ and $f^e = \alpha f$

Firms are predisposed to offer a bribe to the inspector when expected payoffs from corrupt behavior are higher than that for uncorrupt behavior, i.e., when premiums from bribery are positive ($\psi_i^f > 0$):

$$\psi_i^f = f^e - (B_i + p^e)$$

Therefore, expected gains from corrupt behavior by a firm depend on the expected fee for undercompliance (f^e) and the expected cost of bribery ($B_i + p^e$). Note that the premium from bribery is the same for all undercompliant firms and, therefore, whenever $f^e > p^e$, firms are willing to offer a positive bribe.

For corruption to emerge, it is necessary that, in the second step, firms offer bribes large enough to compensate the inspector for the risk of being legally prosecuted, such that the inspector actually becomes corrupt in the third step.

Lemma 3: *For corruption to emerge it is necessary for there to exist a set of values of briberies* $\hat{B}_i$ *which satisfy* $\sum_i \hat{B}_i > P^e$ *and* $\hat{B}_i < f^e - p^e$.

Lemma 3 defines a range of values for B_i, where all these values are capable of inducing corruption. Final payments will depend on the mechanism upon which contributions are determined; thereby influencing a firm's negotiating power, profits, or the like[11]. The determination of the exact value of B_i is out of the scope of this chapter. However, it is worth mentioning that, given assumed profit asymmetries, this value may differ between firms.

[11] This finding is formally similar to results by Segerson and Miceli (1998), who show that there is a region of mutually beneficial voluntary agreements between two bargainers.

Moving to the first step of the game, firms decide whether to comply or not with the environmental standard attending to future moves in steps two and three. This decision is explained in the following sections in the case of a two-player game.

4.4.1. First step with autonomous firms

It may be the case that parameters of the game are such that, in step two, firms' decisions are autonomous from one another. This holds for the two extreme situations in which: (i) corruption can not emerge because the set $\hat{B}_i$ of lemma 3 is empty, and (ii) firms' capacity for offering individual bribes is high enough to corrupt the inspector in isolation ($f^e - p^e > B_i > P^e$).

The effect on environmental contributions from introducing an environmental standard depends on the relation between non-monetary motivational aspects present under open access (β_i) and costs associated with undercompliance in the regulatory setting (f^e if there are no individual incentives for a firm to become corrupt, that is, if $f^e < (B_i + p^e)$ or $(B_i + p^e)$ otherwise). The normal form representation of the first step with autonomous firms is shown in figure 3.

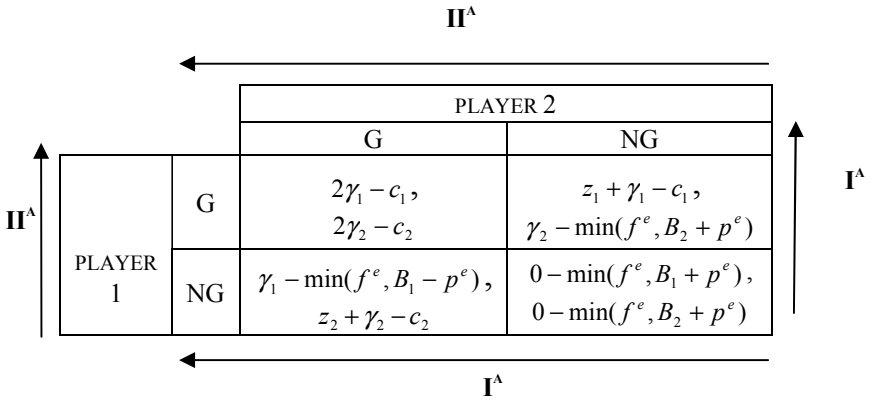

Fig. 4.3. Normal form representation of corrupt public intervention with autonomous firms.

Resulting equilibrium conditions are as follows:

Condition I^A: $c_i < \gamma_i + z_i + \min(f^e, B_i + p^e)$ for *i*= 1 and/or 2

Condition II^A: $c_i < \gamma_i + \min(f^e, B_i + p^e)$ for *i*= 1 and 2

Where these conditions play a similar role as I^O and II^O in section 4.3, that is, condition I^A is necessary and sufficient for at least one firm to comply, whereas condition II^A is necessary and sufficient for full compliance. It can be seen that, again, condition II^A is a subset of condition I^A.

The comparison of the open access and regulated settings give place to the following propositions (see figure 4):

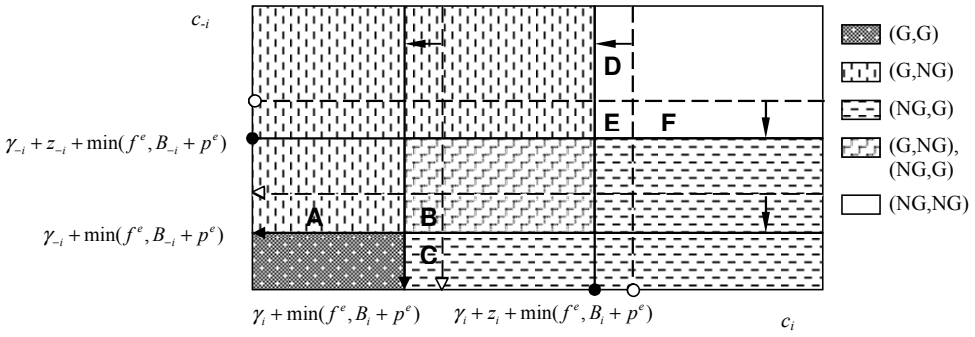

Fig. 4.4. Equilibrium diagram illustrating the parameter regimes for different types of Nash equilibria under corrupt public intervention with autonomous firms. Areas A to C show reductions in the area in which both firms undertake abatement, whereas areas D to F show expansions of the area in which no firm abates.

Proposition 1: *In the case where a firm's corruption decisions are autonomous, whenever* $\min(f^e, B_i + p^e) < \beta_i$ *for* $\forall i$*, the range of abatement costs that supports equilibria where both firms undertake abatement activities is smaller; the range of abatement costs that supports tragedy equilibria is larger; and the range of abatement costs that supports asymmetric equilibria where only one firm undertakes abatement costs moves to lower values.*

Therefore, according to proposition 1, if the expected costs derived from undercompliance are low enough, the introduction of the standard might generate lower abatement by firms. Whether this happens will depend on the parameter values. Specifically, situations such as those in areas A-F in figure 4 will unambiguously imply a worsening of environmental conditions triggered by public intervention12. Selection of environmental strategies by firms does not change in any

12 Whenever abatement costs are set within the ranges $c_i \in \left(\gamma_i + \min(f^e, B_i + p^e), \gamma_i + \beta_i\right) \cap c_{-i} < \gamma_{-i} + \beta_{-i}$ and/or $c_i \in \left(\gamma_i + z_i + \min(f^e, B_i + p^e), \gamma_i + z_i + \beta_i\right) \cap c_{-i} > \gamma_{-i} + z_{-i} + \min(f^e, B_i + p^e)$, the introduction of a standard whose expected fee meets proposition 1 entails lower contributions in equilibrium with respect to the open access situation.

other areas after public intervention. Thus, in these other areas, governmental resources devoted to the creation and enforcement of the standard are not capable of modifying the environmental quality of the CPR. The same argumentation would hold for sufficiently enforced standards ($\min(f^e, B_i + p^e) > \beta_i$ for $\forall i$). Experimental findings in Cardenas (2004) and Cardenas et al. (2000) can be the result of players' location in these no-change areas. Cardenas et al. (2000) find that a regulation economically designed to change the behavior of CPR users has no sizeable effects on players' strategy selection. And Cardenas (2004) shows very little difference in average pressures on a resource across weak (f^e_{low}) and strong (f^e_{high}) environmental regulation enforcement[13].

4.4.2. First step with conditional firms

More interesting results are obtained when undercompliant firms prefer to bribe inspectors (that is, the premium from bribery is positive) but are incapable of corrupting the inspector in isolation. It may be the case that the threat of punishment by the government to inspectors that engage in corrupt activities makes the inspector demand bribes high enough so as to preclude single firms from corrupting her in isolation ($P^e > B_i$). Only combined bribes from both firms would be capable of corrupting the inspector ($\Sigma B_i > P^e$). The resulting normal form of this first step is presented in figure 5.

Now, equilibrium conditions are $(I,II)^C$, with superscript referring to the conditional behavior of firms.

Condition I^C: $c_i < \gamma_i + z_i + B_i + p^e$ for i= 1 and/or 2

Condition II^C: $c_i < \gamma_i + f^e$ for i= 1 and 2

As can be seen, conditions I^C and II^C are not equally modified with respect to the open access situation. Therefore, no relation between them can be established a priori.

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13 Expending public resources to improve detection rates or enhancing the values of fees to increase expected fees would only improve environmental choices under equilibrium for abatement costs within the ranges $c_i \in (\gamma_i + f^e_{low}, \gamma_i + f^e_{high}) \cap c_{-i} < \gamma_{-i} + f^e_{high}$; or $c_i \in \left(\gamma_i + z_i + f^e_{low}, \gamma_i + z_i + f^e_{high}\right) \cap c_{-i} > \gamma_{-i} + z_{-i} + \beta_{-i}$. For any other combination of abatement costs, necessary investments for increasing the enforcement of regulations would not be compensated by any increase in environmental contributions under equilibrium.

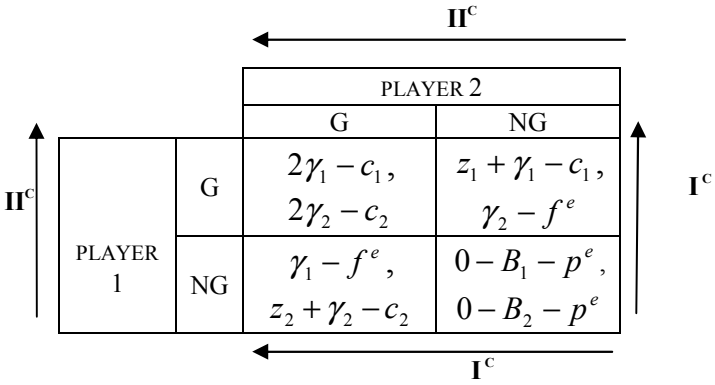


Fig. 4.5. Normal form representation of corrupt public intervention where firms engage in conditional bribery.

The relative restrictiveness of the conditions depends on the relative magnitude of premiums from green differentiation (z_i) and the premium from bribery ($\psi_i^f = f^e - (B_i + p^e)$). Three different possible patterns of equilibria arise, two extreme cases ($\psi_i^f < z_i$, $\forall i$, and $\psi_i^f > z_i$, $\forall i$) and one intermediate situation, where the relative magnitude of these premiums is different for each firm ($\psi_i^f > z_i$ and $\psi_{-i}^f < z_{-i}$). Finally, we present the particular case in which $\psi_i^f = z_i$, $\forall i$, and analyze consequences on the strategic behavior of firms by changing some of the policy parameters in the game.

Conditional equilibria pattern 1: $0 < \psi_i^f < z_i$, $\forall i$

When firms are not capable of inducing the inspector to become corrupt in isolation, and their premium from bribery is positive and lower than the potential gains from "green" differentiation, condition II^C is a subset of condition I^C. Then, the relationship between conditions I and II is the same as that in the open access situation and section 4.4.1. Therefore proposition 1 also describes changes in the pattern of equilibria in this case. Whenever $\min(f^e, B_i + p^e) < \beta_i$ for $\forall i$, there are ranges of abatement costs for which public intervention reduces the environmental quality of the CPR. Now, the expected cost of bribery and the fee play different roles in modifying the equilibria configuration. If $B_i + p^e < \beta_i$ for $\forall i$, the range of abatement costs that produce tragedy outcomes is expanded, whereas $f^e < \beta_i$ for $\forall i$, narrow the possibility of full compliance results. Given that the premium from bribery is positive, if $f^e < \beta_i$ for $\forall i$, this necessarily implies that $B_i + p^e < \beta_i$ for $\forall i$.

Conditional equilibria pattern 2: $\psi_i^f > z_i > 0$, $\forall i$ **.**

Second, when firms are not capable of inducing the inspector to become corrupt in isolation, and their premium from bribery is positive and higher that the incentives resulting from firms' "green" differentiation, the structure of equilibria varies substantially. The restrictiveness of conditions (I,II) switch, and now condition I^C is a subset of II^C. Consequently, new outcomes of pooling equilibria result when firms meet condition II^c but not condition I^c. This is the case now because pooling equilibria can emerge from firms' *induced* behavior to (under)comply.

By *induced* behavior, we mean that strategic incentives for that firm are such that it follows the other firm's behavior. Given that the other firm does not comply, incentives for an *induced* firm to differentiate by becoming "green" are no longer relevant. Green differentiation requires complying with the environmental standard, and the net cost of that strategy (c_i-γ_i-z_i) is higher than that of follow undercompliant behavior of the other firm and bribe the inspector ($B_i + P^e$) (areas M and N in figure 6). Further, given that the other firm complies, the *induced* player complies too. It is cheaper for an *induced* firm to comply and enjoy increased environmental quality (γ_i-c_i) than to face the expected fee, which is the cost of undercompliance in isolation (f^e) (areas K and Q in figure 6).

The result is that when premiums from bribery (ψ_i^f) are higher than price premiums from green differentiation (z_i), new areas of pooling strategies emerge in figure 6 that were not present in figures 2 and 4. This implies a change in the qualitative equilibria configuration of the game, which leads to more extreme behavior by players.

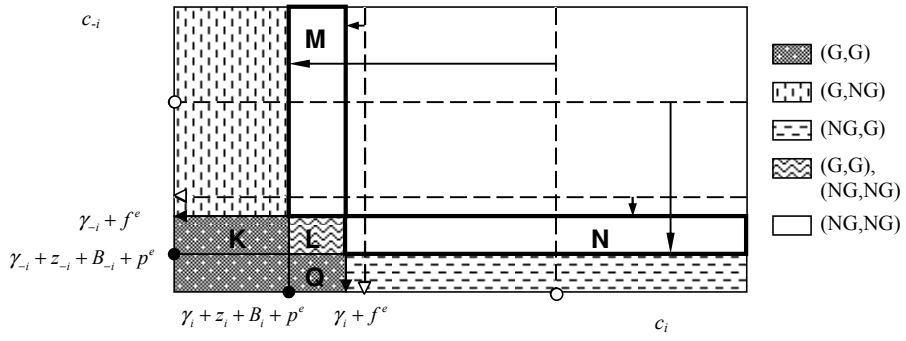


Fig. 4.6. Equilibrium diagram illustrating the parameter regimes for different types of Nash equilibria under corrupt public intervention, where firms engage in conditional bribery ($0 > \psi_i^f > z_i$, $\forall i$ **).**

Proposition 2: *Given that firms can only induce corruption through combined bribery, and that* $\psi_i^f > z_i > 0$, $\forall i$, *a necessary condition for expanding the range of abatement costs that support tragedy equilibria is that proposition 1 holds. For reducing the range of abatement costs that support total compliance, it is sufficient that* $\max(f^e, B_i + p^e) < \beta_i$, $\forall i$. *This finding emerges as a result of induced behavior by firms.*

In addition, it is noteworthy that, for certain values of abatement costs, both firms undertake *induced* behavior (area L in figure 6). As a result, two equilibria in pure strategies emerge whereby either both firms comply or both firms undercomply. Therefore, firms are indifferent between full compliance and tragedy outcomes. According to Camerer (2003), this mixed-strategy equilibrium can be interpreted as reflecting a certain population of nature-based regions where in some of these regions all firms choose to invest in environmental improvements and in some others all firms undercomply. Thus, different destinations with the parameter configurations in area L (figure 6) could result in opposite results.

Conditional equilibria pattern 3: $0 < \psi_i^f < z_i$ **and** $\psi_{-i}^f > 0 > z_{-i}$**.**

Third, it is possible to achieve an intermediate situation between the previous two, where premiums from bribery are large for one of the firms with respect to potential premiums from "green" differentiation (let us assume, without any loss of generality, that this happens for player $-i$), whereas it is small for the other firm (player i), as can be seen in figure 7. As a result, a different pattern of equilibria emerges. Areas K and N in figure 7 are equivalent to those in figure 6. However, areas S to T respond to different strategic decisions by firms.

In this case, condition I^C is a subset of condition II^C for firm $-i$ (as in the conditional equilibria pattern 2) whereas condition II^C is a subset of condition I^C for firm i (as in sections 4.3 and 4.4.1). As a result, firm $-i$ shows *induced* behavior for abatement cost values corresponding to the vertical side of areas K and N in figure 7 (for those abatement costs that meet condition II^C but not condition I^C). In addition, firm i shows *discouraged* behavior for abatement cost values corresponding to the horizontal side of areas S and T (for those that meet condition I^C but not condition II^C).

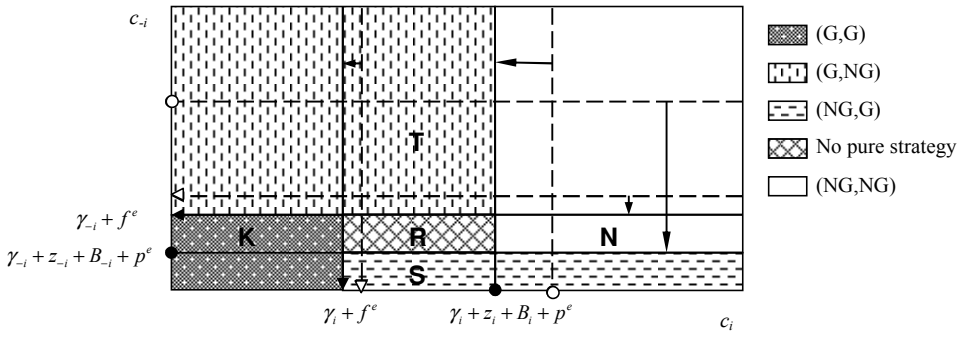


Fig. 4.7. Equilibrium diagram illustrating the parameter regimes for different types of Nash equilibria under corrupt public intervention, where firm 1 is autonomous and firm 2 has conditional bribery ($0 > \psi_i^f < z_i$ and $\psi_{-i}^f > z_{-i} > 0$).

We define *discouraged* behavior as behavior that entails a firm to differentiate from another firm's behavior. Given that firm $-i$ undercomplies, firm i prefers to comply with the standard (area T in figure 7). Firm i prefers to comply to obtain the demand effect derived from undertaking abatement activities in isolation ($\gamma_i+z_i-c_i$) rather than having to face bribery costs ($-B_i-p^e$). But if the other firm complies, the *discouraged* firm prefers to undercomply (area S in figure 7), as the costs of compliance when it does not entail "green" differentiation ($c_i-\gamma_i$) are higher than the cost of facing a certain probability of being fined, which is the cost of undercompliance in isolation (as implied by condition II^C).

Since not all firms now follow *induced* behavior, but some follow *discouraged* behavior, pooling equilibria are not so widely present. This is an intermediate situation between equilibra patterns 1 and 2. Quite interestingly, this pattern of equilibria generates a range of values for abatement costs for which no equilibrium in pure strategies exists due to opposite strategies pursued by players (area R in figure 7). When parameters in the game are such that firm i follows *discouraged* strategies at the same time that firm $-i$ follows *induced* strategies, the result is one equilibrium in mixed strategies where none of the players' behavior is totally predictable. Under this equilibrium, firm i defeats the environmental standard more often than not while firm $-i$ follows compliance strategies more often than not. The actual probabilities of following each strategy depend on the relation between the parameters of the game.

Conditional equilibria pattern 4: $0 < \psi_i^f = z_i$, $\forall i$

To better understand the difference between firms' autonomous and conditional behavior, let us consider a particular situation in which the premium from bribery of both firms is positive and strictly equal to the price premium from green differ-

entiation. Under this situation, conditions I and II are equivalent, leading to the equilibrium diagram presented in figure 8.

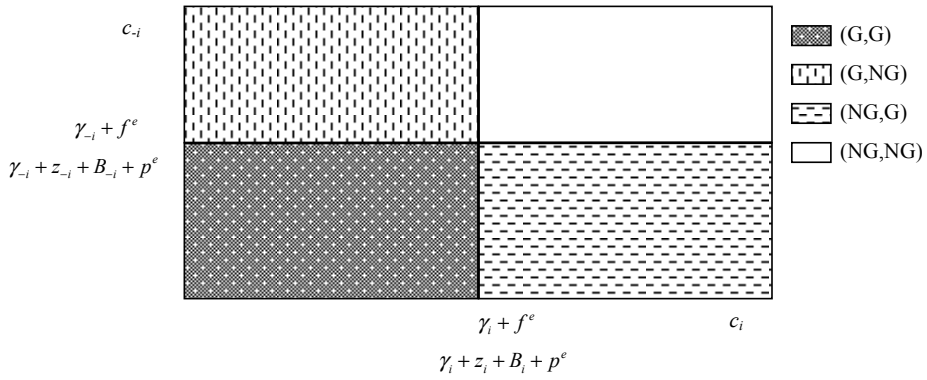
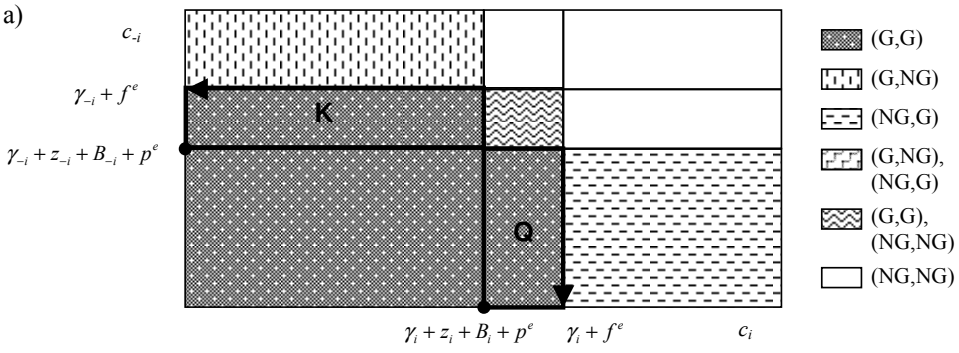


Fig. 4.8. Equilibrium diagram illustrating the parameter regimes for different types of Nash equilibria under corrupt public intervention, when $0 > \psi_i^f = z_i$, $\forall i$.

Starting from this situation, we consider modifications of two policy parameters: the expected fee from undercompliance and expected punishments from bribery. The resulting equilibria configurations of each of these policy changes are substantially different. Increases in f^e generates conditional behavior by both firms (figure 9.a), whereas increases in B_i+p^e results in a behavior equivalent to that of autonomous firms[14] (figure 9.b).

a)



[14] Recall that the conditional pattern of equilibria 1 is equivalent to that of autonomous firms.

b)

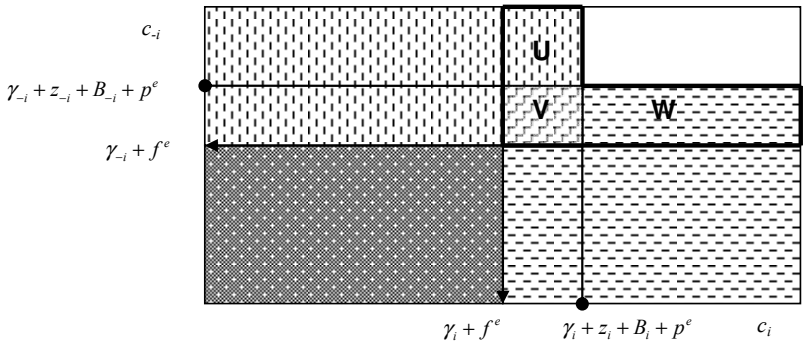


Fig. 4.9. Equilibrium diagram illustrating parameter regimes for different types of Nash equilibria after changes in fees from undercompliance and bribing costs under corrupt public intervention, when, initially, $0 > \psi_i^f = z_i, \ \forall i$.

In the first case (figure 4.9.a), the policy change expands the area of full compliance, whereas the area of no compliance is not modified. In the second case (figure 4.9.b), the area of full compliance does not change, whereas the area of no compliance shrinks. Therefore, changes in the policy parameters of the game lead to more extreme behavior under conditional behavior (increases in full compliance in areas K and Q in figure 4.9.a) and to a wider range of abatement costs, where at least one of the firms complies under autonomous behavior (areas U, V, and W in figure 4.9.b).

4.5. An extension: Unregulated tourism operators

Arguably, crowding out is not the only source of environmental policy ineffectiveness. In this section, we show that ineffectiveness in environmental policy can stem from an uneven enforcement of regulation among firms. In many tourism destinations, it is typical to find businesses that provide undeclared tourism services to avoid paying taxes and other costs associated with their operation (e.g., fiscal obligations). We therefore consider a situation where one of the firms is never subject to monitoring by public agencies, and therefore eventual undercompliance with environmental regulation is not detected. Consequently, when an environmental standard such as that presented in section 4.4 is introduced, unregulated operators remain de facto under an open access institutional setting.

To show the role of this new assumption, let us assume that there are no nonmonetary motivations, and therefore crowding-out plays no role. We also rule out the possibility of corruption. Let us also assume that, under open access, lemma 1

holds only for firm 1, while lemma 2 fails to hold for any firm. Therefore, firm 2's dominant strategy is not to make environmental investments, whereas firm 1 engages in unilateral commitments because premiums from green differentiation, jointly with premiums from increased environmental quality ($z_1+\gamma_1$), more than compensate for abatement costs (c_1).

Let us further consider that firm 1 is, in addition, an unregulated firm that does not report its economic activity to the government. Firm 2, on the other hand, is legal and subject to governmental mandates on its operations. In this context, introducing an environmental regulation determines the following payoff functions for each firm:

$$U_1 = q_1\left[x + \delta_1(n_{-i}^g)\cdot g_1 + \gamma_1(n^g)\right] - c_1 \cdot d_1 - co$$
$$U_2 = \Pi_2 = q_2\left[x + \delta_2(n_{-i}^g)\cdot g_2 + \gamma_2(n^g)\right] - c_2 \cdot d_2 - co - f^e \cdot (1 - g_2)$$

The normal form representation of the resulting game is represented in figure 10, and the resulting equilibrium conditions are:

Condition I^{U}: $c_1 < \gamma_1 + z_1$

$c_2 > \gamma_2 + z_2 + f^e$

Condition II^{U}: $c_1 < \gamma_1$

$c_2 > \gamma_2 + f^e$

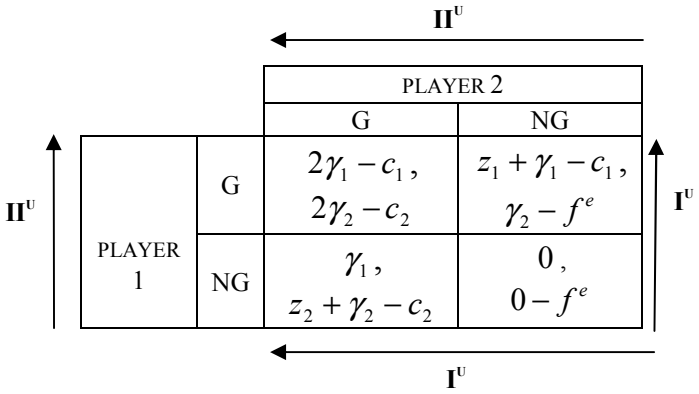


Fig. 4.10. Normal form representation of abatement under public intervention with unregulated firms.

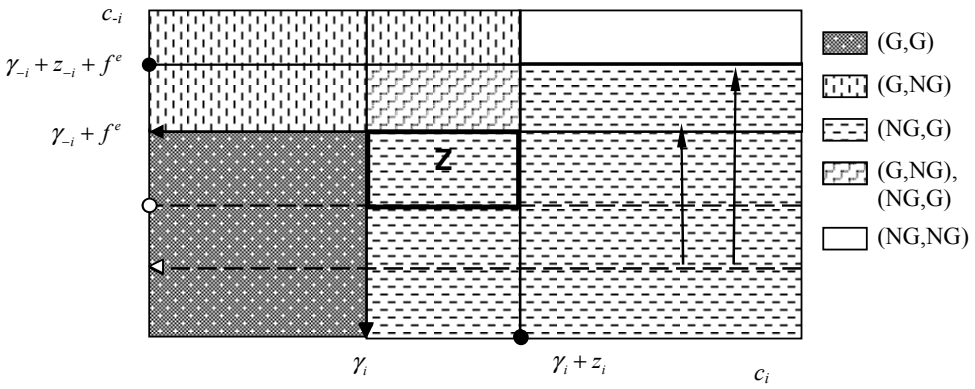


Fig. 4.11. Equilibrium diagram illustrating the parameter regimes for different types of Nash equilibria under public intervention with unregulated firms.

The new assumption is relevant for area Z in figure 11, where firm 1 implements abatement under open access, whereas firm 2 does not. For a regulation strong enough, compliance becomes a dominant strategy for the regulated firm, (that is, for firm 2). Once it loses the differentiation premium, however, the unregulated firm no longer has incentives to engage in abatement activities, so the effect on total environmental quality in null.

4.6. Conclusion

This chapter has developed a game theoretic model to analyze environmental policy for the management of a recreational natural CPR. We first presented an open access game where tourism firms decide whether or not to undertake unilateral commitments to preserve the natural CPR in the region. We show that an empirically founded game that provides an alternative to a prisoner dilemma game can be designed, whereby non-tragedy outcomes can arise under reasonable restrictions on the parameter values.

This result has profound policy implications, since the outcomes resulting from environmental policies are critically dependent on the incentive structure of agents. Wrong or incomplete information about agents' incentives can be an important source of policy failure. Policies may change the contextual factors in which firms operate, without controlling the consequences. Thus, environmental policy should consider that voluntary environmental initiatives may emerge under open access scenarios due to market incentives, non-monetary motivations, or both. Consequently, public administration should put more efforts into complementing rather than displacing self-organizing capacities (Marshall, 2005). In this

quest, public administrations will need to understand the incentive structures for agents and changes to these incentive structures resulting from public intervention.

Second, we extend the open access model to include public intervention, which might not be perfect in its implementation in terms of detection rates and potential emergence of corruption. We show that improvements in environmental contributions may result, but that public intervention can also reduce environmental abatement by users. Our results show on the one hand that environmental decisions by firms that are affected by a regulation are based on the expected costs of undercompliance, with those being either the expected fees from breaking the regulation or the expected costs of bribery, whichever is cheaper. On the other hand, we show that when premiums from bribery are higher than premiums from green differentiation, firms' incentive structures are substantially modified and, as a result, firms' environmental strategies tend to converge to pooling equilibria more easily. Consequently, potential improvements or detriments to environmental quality resulting from government's intervention are more intense.

From a policy perspective, our results show that it is particularly relevant to consider potential administrative corruption. Public administrations should devote sufficient public resources to reduce incentives for corruption in they want to avoid scenarios where extreme results are prevalent. For bad or good, agents' behavior under conditions of high bribery premiums become more extreme.

In addition, this chapter shows that a context in which environmental policy is ineffective can be built even after relaxing the model's main assumptions. This is demonstrated through the case of unregulated firms, which is extensive in the tourism industry. We show that firms operating in the informal economy might modify their environmental behavior as a result of strategic decisions after a standard affects competing firms, even though unregulated firms, by definition, are not affected by regulations. This might result in a mere exchange of environmental behavior between players, without any effect on aggregate environmental outcomes.

Several limitations are present in this model. We have treated governmental intervention as exogenous to the model. It would be interesting to make governmental preferences endogenous. Further, the way we have modeled corruption is very simple. Future research could develop more detailed analysis of administrative corruption by analyzing the emergence of corruption under different negotiation mechanisms (ultimatum offers, Nash bargaining or others) and consider that offering bribes is a mechanism of information disclosure.

In addition, several aspects still remain unclear in the literature on governance structures for environmental policy in nature-based tourism regions. Future research extending the literature on institutional management of recreational uses of natural CPRs should consider other specificities of consumer services that have not been analyzed in this chapter. As an example, the existence of tour operators as intermediaries between the industry's demand and supply conditions both market factors and competition, introducing an additional principal agent strategic problem. Further, the soft environmental pressures generated by recreational usage

are comparable to pressures introduced by residents, increasing the importance of simultaneously considering the environmental behavior of the tourism industry and residents together. Along with these limitations, the close interaction between production and consumption in recreation, the perishability of services, and the heterogeneity of firms in the tourism industry means that an extension of the literature on institutional management of natural resources to recreational uses in tourism settings is not straightforward. Finally, further research on the limitations of public intervention on recreational natural resources would be valuable. Here, we have explored implications stemming from corruption and imperfect detection rates motivated by environmental impacts on a resource that can be large in extension and difficult to observe. Other factors, however, could also be explored. Uncertainty in effects related to climate change on natural resources with tourist appeal, or conflicting uses with extractive activities that generate different pressures on resources are only two examples of additional possible extensions of this research.

4.7. References

Alegre, J., & Cladera, M. (2006). Repeat visitation in mature sun and sand holiday destinations. *Journal of Travel Research*, 44, 288-297.

Alegre, J., & Juaneda, C. (2006). Destination loyalty: Consumers' economic behavior. *Annals of Tourism Research*, 33, 648-706.

Alegre, J., & Pou, L. (2003). El turismo de sol y playa desde la perspectiva de los consumidores Europeos. Un nuevo desafío en el desarrollo turístico de Baleares. In *Serie Estudios Regionales Islas Baleares* (pp. 149-176): Servicio de Estudios BBVA.

Álvarez, M., Burgos, J., & Céspedes, J. (2001). An analysis of environmental management, organizational context and performance of Spanish hotels. *Omega*, 29, 457-471.

Amacher, G., Koskela, E., & Ollikainen, M. (2004). Environmental quality competition and ecolabeling. *Journal of Environmental Economics and Management*, 47, 284-306.

Anderson, J., & Gray, C. (2006). *Anticorruption in transition 3: Who is succeeding and why?* World Bank.

Andrews, R. (1998). Environmental regulation and business `self-regulation´. *Policy Sciences*, 31, 177-197.

Anton, W., Deltas, G., & Khanna, M. (2004). Incentives for environmental self-regulation and implications for environmental performance. *Journal of Environmental Economics and Management*, 48, 632-654.

Arora, S., & Gangopadhyay, S. (1995). Toward a theoretical model of voluntary overcompliance. *Journal of Economic Behavior & Organization*, 28, 289-309.

Blanco, E., Rey-Maquieira, J., & Lozano, J. (2009). Economic Incentives for Tourism Firms to Undertake Voluntary Environmental Management. *Tourism Management*, 30, 112-122.

Brau, R., & Carraro, C. (2004). *The economic analysis of voluntary approaches to environmental protection. A survey*, Working papers: Centro Ricerche economiche nord sud. Università di Cagliari, Università di Sassari.

Brohman, J. (1996). New directions in tourism for third world development. *Annals of Tourism Research*, 23, 48-70.

Buckley, R. (2002). Tourism ecolabels. *Annals of Tourism Research*, 29, 183-208.

Butler, R. (1980). The concept of a tourist area cycle of evolution: implications for management of resources. *Canadian Geographer*, 24, 5-12.

Calveras, A. (2003). Incentives of international and local hotel chains to invest in environmental quality. *Tourism Economics*, 9, 297-306.

Calveras, A. (2007). Expansion of a hotel chain and environmental quality. *Investigaciones económicas*, XXXI, 263-295.

Calveras, A., & Vera-Hernández, M. (2005). Quality externalities among hotel establishments: what is the impact of tour operators? *Tourism Economics*, 11, 571-593.

Camerer, C. (2003). *Behavioral game theory: Experiments in strategic interaction*. New Jersey: Princeton University Press.

Candela, G., & Cellini, R. (2006). Investment in tourism market: a dynamic model of differentiated oligopoly. *Environmental and Resource Economics*, 35, 41-58.

Cardenas, J. (2004). Norms from outside and from inside: an experimental analysis on the governance of local ecosystems. *Forest Policy and Economics*, 6, 229-241.

Cardenas, J., & Ostrom, E. (2004). What do people bring into the game? Experiments in the field about cooperation in the commons. *Agricultural Systems*, 82, 307-326.

Cardenas, J., Strandlund, J., & Willis, C. (2000). Local environmental control and institutional crowding-out. *World Development*, 28, 1719-1733.

Carmona-Moreno, E., Céspedes-Lorente, J., & de Burgos-Jimenez, J. (2004). Environmental strategies in Spanish Hotels: Contextual factors and performance. *The Service Industries Journal*, 24, 101-130.

Cerina, F. (2007). Tourism specialization and environmental sustainability in a dynamic economy. *Tourism Economics*, 13, 553-582.

Claver-Cortés, E., Molina-Azoín, J. F., Pereira-Moliner, J., & López-Gamero, M. D. (2007). Environmental strategies and their impact on hotel performance. *Journal of Sustainable Tourism*, 15, 663-679.

Conrad, K. (2005). Price competition and product differentiation when consumers care for the environment. *Environment & Resource Economics*, 31, 1-19.

Crawford, S. E. S., & Ostrom, E. (1995). A grammar of institutions. *The American Political Science Review*, 89, 582-600.

Damania, R. (2002). Environmental controls with corrupt bureaucrats. *Environment and Development Economics*, 7, 407-427.

Dawson, N. L., & Segerson, K. (2008). Voluntary agreements with industries: Participation incentives with industry-wide targets. *Land Economics*, 84, 97-114.

Deci, E. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18, 105-115.

Dewhurst, H., & Thomas, R. (2003). Encouraging sustainable business practices in a non-regulatory environment: A case study of small tourism firms in a UK national park. *Journal of Sustainable Tourism*, 11, 383-403.

Dodds, R., & Joppe, M. (2005). *CSR in the tourism industry? The status of and potential for certification, codes of conduct and guidelines*. I. C. Department, International Finance Corporation, World Bank Group.

Duffy, R. (2000). Shadow players: ecotourism development, corruption and state politics in Belize. *Third World Quarterly*, 21, 549-560.

Frey, B., & Jegen, R. (2001). Motivation crowding theory. *Journal of Economic Surveys*, 15, 589-611.

Glachant, M. (2007). Non-binding voluntary agreements. *Journal of Environmental Economics and Management*, 54, 32-48.

Goeldner, C. R., & Ritchie, J. R. B. (2003). *Tourism: principles, practices, philosophies* (10th ed.). New Jersey: John Wiley & Sons, Inc.

Gómez, C., Lozano, J., & Rey-Maquieira, J. (2008). Environmental policy and long-term welfare in a tourism economy. *Spanish Economic Review*, 10, 41-62.

Healy, R. (1994). The "common pool" problem in tourism landscapes. *Annals of Tourism Research*, 21, 596-611.

Huybers, T., & Bennett, F. (2002a). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2002b). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Ibanez, L., & Grolleau, G. (2008). Can ecolabelling schemes preserve the environment? *Environment & Resource Economics*, 40, 233-249.

Imperial, M. (1999). Institutional analysis and ecosystem-based management: The institutional analysis and development framework. *Environmental Management*, 24, 449-465.

Johnston, D. (2005). An investigation of regulatory and voluntary environmental capital expenditures. *Journal of Accounting and Public Policy*, 24, 175-206.

Kassinis, G., & Soteriou, A. (2005). Greening service organizations: environmental management practices and performance. In S. Sharma, & J. Aragón (Eds.), *Corporate environmental strategy and competitive advantage* (pp. 115-138). Cheltenham: Edward Elgar.

Kassinis, G. I., & Soteriou, A. C. (2003). Greening the service profit chain: The impact of environmental management practices. *Production and Operations Management*, 12, 386-402.

Khanna, M. (2001). Non-mandatory approaches to environmental protection. *Journal of Economic Surveys*, 15, 291-324.

Knowles, T., & Curtis, S. (1999). The market viability of European mass tourist destinations. A post-stagnation life-cycle analysis. *International Journal of Tourism Research*, 1, 87-96.

Kusluvan, S., & Karamustafa, K. (2001). Multinational hotel development in developing countries: an Exploratory analysis of critical policy issues. *International Journal of Tourism Research*, 3, 179-197.

Livernois, J., & McKenna, C. J. (1999). Truth or consequences. Enforcing pollution standards with self-reporting. *Journal of Public Economics*, 71, 415-440.

Lozano, J., Gómez, C., & Rey-Maquieira, J. (2008). The TALC hypothesis and economic growth theory. *Tourism Economics*, 14, 727-749.

Lyon, T., & Maxwell, J. (2002). "Voluntary" approaches to environmental regulation. In M. Franzini, & A. Nicita (Eds.), *Economics Institutions and Environmental Policy* (pp. 75-120). Brookfield, Vermont: Ashgate Publishing.

Lyon, T., & Maxwell, J. (2008). Corporate social responsibility and the environment: A theoretical perspective. *Review of Environmental Economics and Policy*, 2, 240-260.

Manzini, P., & Mariotti, M. (2003). A bargaining model of voluntary environmental agreements. *Journal of Public Economics*, 87, 2725-2736.

Marshall, G. R. (2005). *Economics for collaborative environmental management: Renegotiating the commons*. Sterling: Earthscan.

Mihalic, T. (2000). Environmental management of a tourist destination. A factor of tourism competitiveness. *Tourism Management*, 21, 65-78.

Moraga-González, J. L., & Padrón-Fumero, N. (2002). Environmental policy in a green market. *Environmental and Resource Economics*, 22, 419-447.

Morgan, M. (1991). Dressing up to survive: Marketing Majorca anew. *Tourism Management*, 12, 15-20.

Osés, N., & Viladrich, M. (2007). On the sustainability of common property resources. *Journal of Environmental Economics and Management*, 53, 393-410.

Ostrom, E. (2000). Crowding out citizenship. *Scandinavian Political Studies*, 23, 3-16.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton, N.J.: Woodstock: Princeton University Press.

Ostrom, E., Gardner, R., & Walker, J. (1994). *Rules, games and common pool resources* (7th ed.). Ann Arbor: University of Michigan Press.

Parra, E., García, F. J., & Guitiérrez, D. (2004). Importance of environmental resources and capabilities for firm's competitiveness. The case of the hotel industry in the Canary Islands. *Anatolia*, 15, 183-199.

PATA. (2007). *Asia Travel Intentions Survey. April 2007*. Pacific Asian Travel Association.

Piga, C. (2003). Pigouvian taxation in tourism. *Environment & Resource Economics*, 26, 343-359.

Pintassilgo, P., & Albino, J. (2007). "Tragedy of the commons" in the tourism accommodation industry. *Tourism Economics*, 13, 209-224.

Portney, P. R. (2008). The (not so) new corporate social responsibility: An empirical perspective. *Review of Environmental Economics and Policy*, 2, 261-275.

Rey-Maquieira, J., Lozano, J., & Gómez, C. (2005). Land, environmental externalities and tourism development. In A. Lanza, A. Markandya, & F. Pigliaru (Eds.), *The Economics of Tourism And Sustainable Development*: Edward Elgar.

Ritchie, B., & Crouch, G. (2000). The competitive destination: A sustainability perspective. *Tourism Management*, 21, 1-7.

Rivera, J. (2002). Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences*, 35, 333-360.

Rivera, J. (2004). Institutional pressures and voluntary environmental behavior in developing countries: Evidence from the Costa Rican hotel industry. *Society and Natural Resources*, 17, 779-797.

Sedjo, R., & Swallow, S. (2002). Voluntary eco-labeling and the price premium. *Land Economics*, 78, 272-284.

Segerson, K., & Miceli, T. J. (1998). Voluntary environmental agreements: Good or bad news for environmental protection? *Journal of Environmental Economics and Management*, 36, 109-130.

Sekhar, N. (2003). Local people's attitudes towards conservation and wildlife tourism around Sariska Tiger Reserve, India. *Journal of Environmental Management*, 69, 339-347.

Sethi, R., & Somanathan, E. (1996). The evolution of social norms in common property resource use. *American Economic Review*, 86, 766-788.

Sirakaya, E. (1997). Attitudinal compliance with ecotourism guidelines. *Annals of Tourism Research*, 24, 919-950.

Sirakaya, E., & Uysal, M. (1997). Can sanctions and rewards explain conformance behavior of tour operators with ecotourism guidelines? *Journal of Sustainable Tourism*, 5, 322-332.

Stonich, S. (1998). Political ecology of tourism. *Annals of Tourism Research*, 25, 25-54.

Tarui, N., Mason, C., Polansky, S., & Ellis, G. (2008). Cooperation in the commons with unobservable actions. *Journal of Environmental Economics and Management*, 55, 37-51.

Tisdell, C. (2001). National gains from international tourism in the light of environmental factors: Further considerations. In C. Tisdell (Ed.), *Tourism economics, the environment and development: Analysis and policy* (pp. 55-67): Edward Elgar.

Vidovic, M., & Khanna, N. (2007). Can voluntary pollution prevention programs fulfill their promises? Further evidence from EPA's 33/50 Program. *Journal of Environmental Economics and Management*, 53, 180-195.

Vidreras, J., & Alberini, A. (2000). The appeal of voluntary environmental programs: which firms participate and why? *Contemporary Economic Policy*, 18, 449-461.

Wilson, D. (1997). Paradoxes of tourism in Goa. *Annals of Tourism Research*, 24, 52-75.

Wilson, J., & Damania, R. (2005). Corruption, political competition and environmental policy. *Journal of Environmental Economics and Management*, 49, 516–535.

World_Bank. (2000). *Anticorruption in transition: A contribution to the policy debate*. World Bank.

WTO (2004). *Indicators of Sustainable Development for Tourism Destinations: A Guidebook*. Madrid: World Tourism Organization.

Chapter 5: A dynamic approach to voluntary environmental contributions

Unilateral commitments and ecolabels in tourism

5.1. Introduction

Voluntary approaches are increasingly considered as relevant policy instruments to complement traditional command-and-control regulation (Anton, Deltas, & Khanna, 2004; Brau & Carraro, 2004; Dawson & Segerson, 2008; Delmas & Keller, 2005; Glachant, 2007; Khanna, 2001; Lyon & Maxwell, 2002; Sasidharan, Sirakaya, & Kerstetter, 2002; Segerson & Miceli, 1998). 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[1] (Delmas et al., 2005; Khanna, 2001). 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).

Given their non-mandatory nature, the economics literature generally holds the view that voluntary programs must generate short-term economic gains to promote compliance[2] (Alberini et al., 2002; Dawson et al., 2008; Khanna, 2001). Consequently, it is suggested that voluntary programs connect private benefits to voluntary environmental action (Delmas et al., 2005). According to the literature, some motives behind a firm's decision to adopt a voluntary agreement are regulatory

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1 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 et al., 2008).

2 Alberini et al. (2002) lists personal satisfaction or utility gained from undertaking activities that protect the environment as one of the incentives to participate in voluntary programs. Because of interest in economic motivation of greener behavior, we do not consider this motivation even though some empirical evidence exists in tourism supporting that personal morality have a positive relationship with compliance with environmental codes of conduct by eco-tour operators (Sirakaya, 1997; Sirakaya & Uysal, 1997).

gains, demand effects, cost efficiency, and technical assistance (Amacher, Koskela, & Ollikainen, 2004; Anton et al., 2004; Arora & Gangopadhyay, 1995; Brau et al., 2004; Khanna, 2001; Lyon et al., 2002; Lyon & Maxwell, 2008; Portney, 2008; Vidovic & Khanna, 2007; Vidreras & Alberini, 2000).

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 (Dawson et al., 2008; Glachant, 2007; Manzini & Mariotti, 2003; Segerson et al., 1998). The latter analyzes the market implications of product differentiation when consumers are concerned about environmental aspects of goods and services (Amacher et al., 2004; Arora et al., 1995; Conrad, 2005; Ibanez & Grolleau, 2008; Moraga-González & Padrón-Fumero, 2002; Sedjo & Swallow, 2002).

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 a natural common-pool resource (CPR), which are an increasingly relevant reality, according to empirical studies (Ayuso, 2006, 2007; Buckley, 2002; Font, 2002; Mihalic, 2000; Sasidharan et al., 2002; UNEP, 1998; WTO, 2002). Our primary interest is to model the changes in incentives to undertake environmental contributions by CPR-using tourism firms when an ecolabel is introduced, that is, when an institutional change based on the voluntary adherence of firms is implemented. Tourism-related uses of natural resources are an increasingly relevant type of use of natural common-pool resources. Time-series empirical evidence has shown that traditional recreational uses, such as visits to national parks, hunting and fishing, camping, backpacking and hiking have been declining in the US and Japan over the last 20 years (Pergams & Zaradic, 2008). On the other hand, nature-based tourism has turned out to be the fastest growing segment of the global tourism market (Huybers & Bennett, 2003; Sirakaya et al., 1997)[3]. 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; Foster, Sampson, & Dunn, 2000; Grove, Fisk, Pickett, & Kangun, 1996). Given that the objective of voluntary initiatives is to complement regulatory frameworks (WTO, 2002), voluntary initiatives have to improve performance above legal compliance to achieve relevant improvements in the main problems of tourism (Buckley, 2002). This is particularly relevant since tourism is not very regulated by public authorities compared to other sectors (Ayuso, 2007)[4].

We consider two different voluntary environmental initiatives in tourism: unilateral commitments and ecolabels. We first consider a model where the only

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[3] International tourism accounts for US$856 billion tourism receipts and 903 millions of tourism arrivals (WTO, 2008).

[4] For example, it is reported that coastal regions are subject to impacts from tourism due to an inadequate legislative setting, administrative infrastructures, and managerial capabilities (Sasidharan et al., 2002).

available environmental strategy to the population of firms is to undertake unilateral commitments. Later, we introduce an ecolabel as a second available environmentally-friendly strategy. We analyze the change in the environmental behavior of firms after the ecolabel has been created and identify the circumstances under which the certification program can be stable in the long run. Both models are presented for exogenous and endogenous levels of natural capital. By integrating the dynamics of the resource stock, as suggested by Sethi and Somanathan (1996), the stability of population configurations is considered together with the sustainability of resource use.

To do so, we adopt evolutionary game theory to build our model. Since evolutionary game theory studies *populations* playing games, rather than the behavior of rational *individuals*, it is particularly useful for studying institutional change (Friedman, 1991, 1998; Mailath, 1998). The origins of such an approach are in evolutionary biology, but the approach is increasingly being used in economic and social sciences (Nowak & 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 & 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 et al., 2003; Nowak et al., 2004)

The main advantage of using evolutionary game theory is that it enables the researcher to discriminate between different equilibria (Mailath, 1998; Nowak et al., 2004; Sethi et al., 1996). 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. It is argued that standard game theory frequently fails to consider the dynamic nature of natural resources on equilibrium outcomes (Osés & Viladrich, 2007). This is partly because defining and interpreting subgame perfect equilibrium is easier with a discrete time approach, whereas analyzing a renewable resource model is more amenable to a continuous time approach (Tarui, Mason, Polansky, & Ellis, 2008). Finally, in evolutionary game theory, the equilibrium that players eventually reach is determined by the original distribution of players in the population, the underlying game, and the way strate-

gies spread (Friedman, 1998; Hofbauer et al., 2003), i.e., history matters in achieving a steady state of the system (Mailath, 1998).

Evolutionary game theory has been previously applied to analyze voluntary environmental behavior (Osés et al., 2007; Sethi et al., 1996). Sethi and Somanathan (1996) analyze players' environmental behaviors in a population where players can extract low or high levels of a natural resource and where costly informal punishment (for those inflicting and suffering it) is possible among players in response to the observed behavior of others. Using the same methodology, Osés and Viladrich (2007) concentrate on results when environmentally sensitive players enjoy informal social benefits associated with responsible behavior. Unlike these previous studies, only market forces motivate voluntary environmental contributions in our model, and we consider two environmentally-friendly strategies as opposed to the non-green strategy. The incentives to participate in a voluntary environmental initiative depend on the comparison between profits resulting from unilateral commitments, ecolabels, and non-green alternatives.

The rest of the chapter is organized as follows. Section 5.2 presents some stylized facts for unilateral commitments and ecolabels in tourism. Sections 5.3 and 5.4 develop the models for unilateral commitments and ecolabels, respectively. In both cases, we first present the population dynamics, then the natural CPR dynamics, and finally the dynamics of the combined system. Results of sections 5.3 and 5.4 show that heterogeneous population compositions where one of the voluntary initiatives coexists with dirtier firms can be asymptotically locally stable, as homogeneous populations can be. Section 5.4 further shows that heterogeneous populations where unilateral commitments, ecolabels and dirty firms coexist can exist but cannot be stable. Section 5.5 presents the conclusion of the study.

5.2. Unilateral commitments and ecolabels in tourism

We are focusing on voluntary improvements of firms' environmental behavior as a result of unilateral commitments and ecolabels. We define unilateral commitments as those initiatives individually undertaken by firms that are not subject to external assessment of participants' behavior. This can include the internal development of firms' own environmental policies, adherence to codes of good practices, and other uncertified environmental practices. Some well known international unilateral commitments are the International Hotels Environment Initiative and the Tour Operators Initiative for Sustainable Tourism (WTO, 2002). Ecolabels, by contrast, imply the certification of a particular level of environmental performance in the production of a tradable product or service (Buckley, 1992), requiring the assessment of participants (Font, 2002). Some international examples in tourism are the Blue Flag Campaign and the Green Globe (WTO, 2002).

To model the environmental decisions of tourism firms regarding adherence to any of these voluntary initiatives, we build on some of the theoretical foundations

of the literature on demand effects as motivators of voluntary action. We assume that consumers' individual decisions are based on utility-maximizing behavior and that part of the society includes in these decisions a trade-off between the environmental attributes of the good and other desired characteristics (Conrad, 2005). We further assume that consumer preference to purchase from green firms is well established and often revealed through increased willingness to pay for products viewed as "clean" (Amacher et al., 2004). Empirical evidence supports this assumption in tourism, especially in nature-based destinations[5]. Most conservative estimates show that up to 5 percent of the overall travel market would pay a premium for sustainable packages (Dodds & Joppe, 2005), and some regional results show that up to 52 percent of visitors would be prepared to pay an extra 10 percent for environmentally-friendly tourism products (PATA, 2007). In North Tropical Queensland, the lower boundary estimate for the willingness to pay by origin markets for an increase in the environmental quality from somewhat spoiled to unspoiled is more than US $480 for a fortnight's holiday (Huybers et al., 2003).

We separately consider three price premiums which might result from this demand effect[6]: a premium from green differentiation, a reputation premium, and a premium from increased environmental quality of the common-pool resource.

First, we hold that firms that preserve the natural environmental beyond the level that is legally mandated, i.e., firms which undertake unilateral commitments and firms which join ecolabels, can obtain a premium from green differentiation (as supported by empirical evidence in Álvarez, Burgos, & Céspedes, 2001; Carmona-Moreno, Céspedes-Lorente, & de Burgos-Jimenez, 2004; Claver-Cortés, Molina-Azoín, Pereira-Moliner, & López-Gamero, 2007; Kassinis & Soteriou, 2003). That is to say, firms can stand out among their competitors by following environmentally sensitive strategies to fill a green market niche (Alberini et al., 2002). Environmental attributes of tourism services are partially observable by consumers (are not pure credence attributes), since there is a high interaction between production and consumption, which can have environmental management implications[7] (Ayuso, 2006; Stoeckl, 2004). Marketing has been effective at taking advantage of this differentiation premium and moving the demand towards environmentally friendly firms (WTO, 2002).

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[5] By nature-based tourism we consider that type of tourism which is reliant on the natural environment as the principal component of the product or an essential setting for the operation activity (Buckley, 2002).

[6] See Sedjo and Swallow (2002) for a discussion on the circumstances under which a willingness to pay for environmental attributes of goods by a significant proportion of consumers results in price differentials for environmentally-friendly firms.

[7] Consistent with previous studies in green market demand, we consider imperfectly informed consumers with green preferences (Arora et al., 1995; Brau et al., 2004; Ibanez et al., 2008; Sedjo et al., 2002). Consumers have some capacity to detect greener behavior, as demonstrated by their generation of premiums from green differentiation, but they are not perfectly able to asses the quality of the commodities they purchase.

Second, tourism firms which belong to an ecolabel can obtain a reputation premium from their environmental efforts (as defended by Buckley, 2002; Font, 2002; WTO, 2002). The high level of tourist response to ecolabeled products has been upheld as one of the most telling indicators of the strength of environmental concern among the general public in many developed nations (Buckley, 2002). Empirical findings show that, among hotels, being enrolled in certification programs with higher levels of environmental performance is significantly related to higher room prices (Rivera, 2002) and higher occupation rates (Font, 2002) relative to hotels which are not members of the ecolabel.

The strength of these reputation premiums reported by empirical evidence might depend on the credibility and diffusion of information released by ecolabels[8]. Credibility of the information released by ecolabels is crucial, since ecolabeling is in danger of being considered a green wash (Font, 2002). Credibility results from the higher criteria required for qualification[9]; the existence of a procedure to assess the performance of applicants (preferably undertaken by independent third parties); the existence of a monitoring system to ensure that the label is only used by those firms who have earned it and that it is withdrawn if no longer applicable; participation of multiple stakeholders in the design and management of ecolabels; and the public image of the promoting institution[10] (Buckley, 2002; Mihalic, 2000; UNEP, 1998; WTO, 2002). In addition, great efforts are devoted by ecolabels to develop marketing strategies. It is argued that a logo is not sufficient recognition of firms' abatement efforts and that further promotion is required to raise the interest of the demand market (UNEP, 1998; WTO, 2002). This marketing is argued to be easier when ecolabels are in place, by making use of press releases, leaflets, displays, brochures, publications and similar items (Mihalic, 2000; UNEP, 1998).

Overall, it is necessary for an ecolabel to provide services to its members in order to raise credibility and diffusion of information in order to be successful. These services are costly, and thus, obtaining enough founding is one of the threats which ecolabels must face. Funding usually come from the promoting institution, public or private foundations, and fees from applicants (WTO, 1999). The literature on ecolabeling in tourism recognizes the relevance of fees, but it also highly recommends keeping fees as low as possible (Font, 2002; Halme, 2001; UNEP, 1998; WTO, 2002). Thus, a general concern in this literature is the

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[8] Ecolabels can provide an opportunity for imperfectly informed consumers to have higher information on the environmental sensitivity of tourism firms before making their final visit (Buckley, 2002; Font, 2002; Sasidharan et al., 2002; UNEP, 1998; WTO, 2002).

[9] Environmental standards to be met to enter an ecolabel are typically higher than those in which firms voluntarily engage in unilateral commitments, since ecolabels should contain substantive criteria that distinguish between firms which have earned the label and those which have not (Buckley, 2002).

[10] The reputation of the promoting institution can increase the confidence on the validity of environmental improvements and of technical consistency (Font, 2002; WTO, 2002).

ability of ecolabels to obtain enough members. An ecolabels' ability to do this is highly related to the technical assistance and guidelines that it can provide to firms in order to improve their environmental behavior and to facilitate adherence (Font, 2002; UNEP, 1998; WTO, 2002). The higher the number of adherents, the higher the financial resources of the initiative, and thus, the higher the level of services it provides, which increase the reputation of the scheme. Based on a world-wide survey on voluntary initiatives in tourism, the WTO (2002) concludes that there is a critical mass of 3 to 10 percent of firms operating in a region that must belong to the initiative to make it viable in the long run. These figures constitute the minimum necessary share to credibly present the ecolabel to the tourism market (Font, 2002) and to offer a real consumption choice to the consumer (WTO, 2002).

The last price premium to be considered is the one resulting from increased environmental quality in the region. The tourism literature considers environmental investments for improving environmental quality as non-excludable goods. Then, consistent with empirical evidence, environmentally-friendly strategies positively affect the profits of all firms (Huybers & Bennett, 2002). The strategic consequences of the existence of this premium in tourism have been previously analyzed, mostly in models of environmental competition between destinations (Calveras, 2003, 2007; Calveras & Vera-Hernández, 2005; Candela & Cellini, 2006; González, León, & Padrón, 2006; Pintassilgo & Albino, 2007).

5.3. The unilateral commitment model

We consider a model where a fixed population of firms $N = \{1,...,n\}$, $n \geq 2$, make use of a common pool renewable natural resource for the recreational enjoyment of their customers. Some examples of what the resource might be are a lake, a piece of shoreline, diving areas, fresh and salt ponds, rivers, caves, forest land, wildlife areas and ski areas (Healy, 1994; Imperial, 1999). Recreational activities have a negative impact on the quality of the resource, but firms can undertake voluntary abatements of their environmental pressures beyond those required by regulation[11].

Similar to Sethi and Somanathan (1996) and Osés and Viladrich (2007), we represent the abatement efforts of each firm $i \in N$ with a binary variable $a_i \in \{a_{ng}, a_g\}$, where a_g corresponds to firms voluntarily undertaking abatement efforts beyond compliance and a_{ng} to firms only complying with regulation (a_g

[11] To exercise this potential, tourism firms can voluntarily undertake either activities to reduce environmental pressures (as more efficient use of raw materials, reduction of pollution emissions, greener purchasing, etc.) or investments for improving the status of an already degraded environment (being some examples a hotel improving the quality of a beach next to it or a coral reef excursions company cleaning its diving area) (Mihalic, 2000).

$>a_{ng}$). We refer to agents choosing a_g as "green" firms, which have undertaken unilateral commitments, and to agents choosing a_{ng} as "non-green" firms. For simplicity in notation we normalize $a_{ng}=0$[12]. The abatement profile of firms, $\vec{a}=(a_1,...,a_n)$, determines the proportion of green firms s_g and that of non-green firms s_{ng} in the population, where $s_{ng}=1-s_g$.

Consistent with empirical evidence in the tourism literature firms' payoffs differ depending on their environmental strategies (Álvarez et al., 2001; Carmona-Moreno et al., 2004; Claver-Cortés et al., 2007; Kassinis et al., 2003). Specifically, some empirical literature (Huybers et al., 2002; Kassinis et al., 2003; PATA, 2007; Rivera, 2002) suggests that this difference can be motivated by a demand effect that generates a competitive/comparative advantage for firms that undertake voluntary environmental actions, and it is usually reflected in the capacity of green firms to charge higher prices. Following this evidence, as first presented in Blanco et al.(2009), we assume that the price at which player *i* sells its tourism product is equal to:

$$P_i = x + \delta(s_{ng}, K)\cdot g(a_i) + \gamma(K), \text{ for } \forall s_{ng} \geq 0 \tag{5.1}$$

where x is a part of the price independent of environmental actions and $g(a_i)=\{0,1\}$ is a dummy variable equal to 1 for firms undertaking abatement efforts beyond of those legally required ($0<a_l<1$) and equal to 0 for non-green firms. Attributes defining $\delta(s_{ng},K)$ and $\gamma(K)$ are,

$$\delta(s_{ng},K)=\begin{cases} z_i \geq 0 & if\ s_{ng}=1 \\ 0 \leq \delta(\cdot) \leq z_i & if\ 0<s_{ng}<1 \\ 0 & if\ s_{ng}=0 \end{cases}$$

$$\text{and } \frac{\partial\delta(\cdot)}{\partial s_{ng}}>0,\ \frac{\partial^2\delta(\cdot)}{\partial s_{ng}^2}<0,\ \lim_{s_{ng}\to 0}\delta(\cdot)=0$$

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[12] Thus, we consider positive reductions in environmental pressures as participation in a unilateral commitment. Other more complex specifications would be possible. For example, a_g could result from profit maximization by firms in a model where premiums from green differentiation also depend on a firm's abatement efforts $\delta(s_{ng},K,a_g)$. Assuming $\partial\delta(\cdot)/\partial a_g>0$, $\partial^2\delta(\cdot)/\partial a_g^2<0$, and $c''(a_g)>0$, the symmetric level of a_g selected by firms would be the result of $\frac{\partial\delta(\cdot)}{\partial a_g}=c'(a_g)$. A second possibility is that the level of a_g is determined by a code of good practices developed by an industry association. In that case, the process of signing-up to the code and abatement decisions by firms should be modeled separately (as in Dawson et al., 2008).

$$\delta(s_{ng},0)=0, \quad \text{and} \quad \frac{\partial\delta(\cdot)}{\partial K}>0,\ \frac{\partial^2\delta(\cdot)}{\partial K^2}<0$$

$$\gamma(0)=0, \quad \text{and} \quad \frac{\partial\gamma(\cdot)}{\partial K}>0,\ \frac{\partial^2\gamma(\cdot)}{\partial K^2}<0$$

These establish that when player *i* undertakes voluntary environmental actions, it is capable of charging a price premium $\delta(\cdot)$, thanks to its environmental differentiation. Differentiation is higher when the proportion of non-green firms (green firms) is higher (lower) in a region. Furthermore, the price premium $\delta(\cdot)$ only takes positive values for positive levels of natural capital in the region and is increasing with the environmental quality of the natural CPR of which firms make use. This positive relationship can be justified either by a higher concentration of more environmentally aware visitors in regions highly-endowed with natural resources or by tourists being more concerned for their environmental pressures in areas with high environmental quality.

In addition, we consider a second price premium $\gamma(\cdot)$ that positively depends on environmental quality and that is common to all firms regardless of their individual environmental behavior. This premium reflects both the non-excludable character of the resource, which is a property of common pool resources, and the fact that environmental amenities constitute a component of the tourism product in nature-based destinations. Some empirical evidence shows that tourists are ready to pay higher prices for higher levels of environmental quality at a tourism destination (Alegre & Cladera, 2006; Alegre & Juaneda, 2006; Huybers et al., 2003).

Building on equation 5.1, the following payoff function can be constructed:

$$\pi_i = q_i[x+\delta(s_{ng},K)\cdot g(a_i)+\gamma(K)]-c(a_i)-co \tag{5.2}$$

where q_i is the quantity produced by the *i*-th firm, which, for simplicity, is assumed to be 1; *co* are costs independent of environmental behavior and $c(a_i)$ is the cost of abatement activities. We assume $c(0)=0$, $c'(a_l)>0$, $\lim_{a_i\to 1} c(a_i)=\infty$. Thus, only green firms incur abatement costs.

For a given level of capital endowment, payoffs for firms following each strategy depend on the composition of the population. According to evolutionary game theory, payoff differentials exert evolutionary pressures on the population composition to evolve in favor of those groups earning the highest payoff. That is to say, firms respond to differences in payoffs by modifying their strategies. This behavioral pattern does not change instantaneously. This is modeled using the replicator dynamics, which is the simplest evolutionary dynamic one can use to investigate

dynamic properties of evolutionary stable strategies (Mailath, 1998; Sethi et al., 1996)[13]:

$$\dot{s}_{ng} = s_{ng}\left(\pi_{ng} - \bar{\pi}\right) \tag{5.3}$$

where $\bar{\pi}$ is the average payoff in the population as a whole, $\bar{\pi} = s_{ng}\pi_{ng} + (1 - s_g)\pi_g$. Combining equations 5.2 and 5.3 the replicator dynamics can be specified as:

$$\dot{s}_{ng} = s_{ng}(1 - s_{ng})[c(a_g) - \delta(s_{ng}, K)] \tag{5.4}$$

Note that since all firms benefit from premiums from increased environmental quality, $\gamma(\cdot)$ does not influence the evolution of the composition of the population.

To model the renewable natural resource**,** we assume that environmental quality varies over time according to the following motion function:

$$\dot{K} = F(K) - D(s_{ng}), \tag{5.5}$$

where $F(K)$ is a replenishment function and $D(s_{ng})$ is the total environmental damage by the population of firms.

We consider a differentiable replenishment function, *F(K)*, satisfying the usual assumptions for describing the dynamics of renewable resources, as represented in figure 5.1. There is a finite carrying capacity $\bar{K}$ of the resource and a minimum level of natural capital $\underline{K}$ $(0 < \underline{K} < \bar{K})$ so that $F(\bar{K}) = 0$ and $F(\underline{K}) = 0$. Between $\bar{K}$ and $\underline{K}$, the resource grows at a positive rate, and it grows at a negative rate

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[13] Given its mathematical expression there are several implicit assumptions. First, the replicator dynamics assumes a well-mixed constant population with a finite number of strategies and posits that the growth rate of shares of strategies in the population is proportional to its success (Nowak et al., 2004). Assuming a constant population makes sense in conservation areas, where a fixed total number of licenses to operate are given or in mature tourism destinations, where a maximum number of rooms or in recreational services might have been reached.

Second, the replicator equation describes selection, no drift and no mutation (Nowak et al., 2004). As a consequence, a strategy missing in the initial population remains absent. However, it is usual to investigate the impacts on the dynamic system resulting from the introduction of a new strategy.

Third, the proportion of individuals choosing a particular behavior increases when the payoff to that behavior exceeds the average payoff in the population and decreases when the reverse is true (Sethi et al., 1996). This conforms to the adoption decisions of firms being likely to be influenced by the norms set by other firms in the industry, originating either a demonstration effect or peer pressure (Anton et al., 2004). In economics, it is usual to motivate change in strategies on that successful behavior becomes more prevalent because market forces select against unsuccessful behavior and because agents imitate successful behavior (Mailath, 1998).

otherwise. This describes the fact that the resource reaches a maximum size $\overline{K}$ and that below $\underline{K}$ replenishment via natural reproduction is impossible even in the absence of environmental damage. For stock levels between $\underline{K}$ and $\overline{K}$ $F''(K)>0$, with $F(K)$ reaching its maximum at K^M.

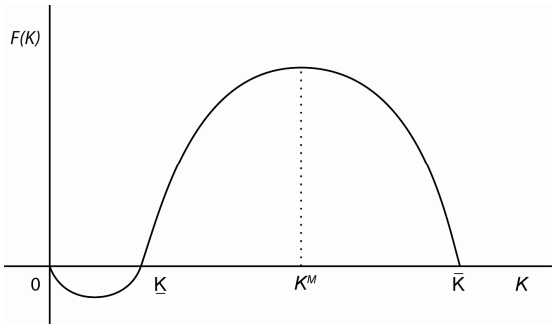

Fig. 5.1. Replenishment function of the CPR.

Regarding environmental damage, we attribute a uniform environmental damage d to each firm, which can be reduced by abatement efforts. Each firm's strategy selection determines its environmental damage, net of abatement, which is d for non-green firms, and $d(1-a_g)$ for green firms. Given our specifications, abatement is open to two different interpretations, either reduction in the environmental pressures (more efficient use of natural inputs or reductions in pollution emissions) or direct investments toward improving the quality of the natural resource. Then, after some straightforward transformations, total environmental damage is $D(s_{ng}) = N[1 - a_g(1 - s_{ng})]$, where d is normalized to one without loss of generality[14].

5.3.1. Population Dynamics

Let us now present the population dynamics when endowment of natural capital in the region is exogenous. Apart from the usefulness of this exercise for later sections, this case could be empirically relevant for those contexts where, due to scale properties, the activity of the model's population as a whole has no noticeable effect on the quality of the resource.

[14] Initial specification of total damage is $D(s_{ng}, s_g) = N \cdot d[s_{ng} + s_g(1 - a_g)]$.

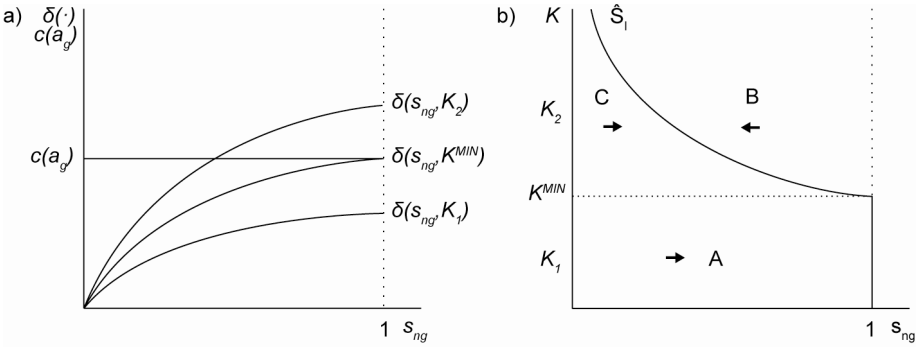

Fig. 5.2. Population dynamics of the unilateral commitment model.

With exogenous natural capital, the dynamics of the system is fully described by equation 5.4. It is easy to verify that there are three steady states: (i) no firms engage in voluntary environmental action, $s_{ng}=1$; (ii) all firms undertake voluntary abatements, $s_{ng}=0$; and (iii) firms are indifferent between being green or non-green, that is, when $\delta(s_{ng},K)=c(a_g)$.

Lemma 5.1: *For a given level of natural capital, a heterogeneous equilibrium of the population composed of non-green and green firms exists if there is a* $s_{ng} \in (0,1)$*, such that* $\delta(s_{ng},K)=c(a_g)$*. Given that this equilibrium exists it is always asymptotically locally stable. A stable homogeneous all-non-green firms equilibrium exists when* $\delta(1,K) < c(a_g)$*. Any homogeneous all-green equilibrium is unstable.*

In figure 5.2.b, $\hat{S}_I$ (for which $\dot{s}_{ng}=0$) represents the steady state levels of s_{ng} for different levels of K. Given the properties of $\delta(\cdot)$this curve shows asymptotic convergence to the vertical axis. As it is shown, there is a level of environmental capital K^{MIN} below which price premiums for green differentiation are lower than extra abatement costs for any population composition, that is, $\delta(1,K^{MIN})=c(a_g)$. Then, below K^{MIN} (area A in figure 5.2.b), $\dot{s}_{ng} < 0$ and, therefore, only homogeneous equilibria with all-non-green populations can be stable.

For natural endowments above K^{MIN}, only heterogeneous equilibria are stable. In Area B in figure 5.2 the proportion of green firms is small enough to make being green profitable, and the dynamics imply a shift of the population toward an increase in this strategy (a fall in s_{ng}). However, when the proportion of green firms is high (area C in figure 5.1), premiums from green differentiation are too low to make this strategy profitable and convergence to the steady state implies a fall in the proportion of green firms (an increase in the proportion of non-green firms).

Some empirical evidence (Álvarez et al., 2001; Claver-Cortés et al., 2007; Kassinis et al., 2003; Rivera, 2002) shows that green firms obtain statistically significant better economic results than other firms at nature-based destinations. In the context of our model, the cases analyzed by this literature would be located in area B and therefore would reflect incomplete adjustment to the steady state.

5.3.2. Resource Dynamics

Let us now analyze the dynamics of the natural resource when the composition of the population is exogenous. According to equation 5.5, the condition for constant capital is $D(s_{ng})=F(K)$. This defines a relationship between the composition of the population and the stock of natural capital as shown in the forth quadrant of figure 5.3, where curves $\tilde{K}(s_{ng})$ and $\hat{K}(s_{ng})$ represent the isoclines of the resource ($\dot{K}=0$). This relationship is obtained using the steady state relationship between environmental damage and natural capital (first quadrant) and that between total damage and the composition of population (third quadrant), and it is drawn for the special case when the natural capital in the steady state is positive even in the more polluting scenario (that is, when s_{ng}=1)[15].

When analyzing the dynamics of the resource for an exogenous s_{ng}, it has to be first noted that the replenishment function is defined such that there is a threshold, $\underline{K}$ below which the resource is doomed to exhaustion regardless of the environmental pressures (area A). Moreover, if natural capital reaches a level between $\underline{K}$ and $\tilde{K}(s_{ng})$, exhaustion is not inevitable but it is not possible to achieve levels of damage low enough to avoid exhaustion with only voluntary environmental behavior as defined in the model. When natural capital is between $\tilde{K}(0)$ and $\hat{K}(0)$, it is possible to avoid exhaustion through voluntary environmental behavior by at least a proportion of the firms. For levels of natural capital above $\hat{K}(0)$, disregarding the composition of the population, environmental damage is higher than the replenishment capacity of the resource, and thus K converges to the isocline $\hat{K}(s_{ng})$.

[15] As non-green firms are those that just meet with environmental regulation, this amounts to say that environmental regulation in place prevents exhaustion at least for certain initial levels of natural capital and n. It is quite straightforward to extend the analysis to cases when regulation is not tight enough to prevent exhaustion for any initial level of natural capital or n.

Lemma 5.2: *$\hat{K}(s_{ng})$ and $\tilde{K}(s_{ng})$ represent curves of equilibria of the resource dynamics. $\hat{K}(s_{ng})$ determines asymptotically locally stable equilibria, for which there is a negative relationship between environmental damage and steady state natural capital, while $\tilde{K}(s_{ng})$ represents unstable equilibria, characterized by a positive relationship between environmental damage and steady state natural capital.*

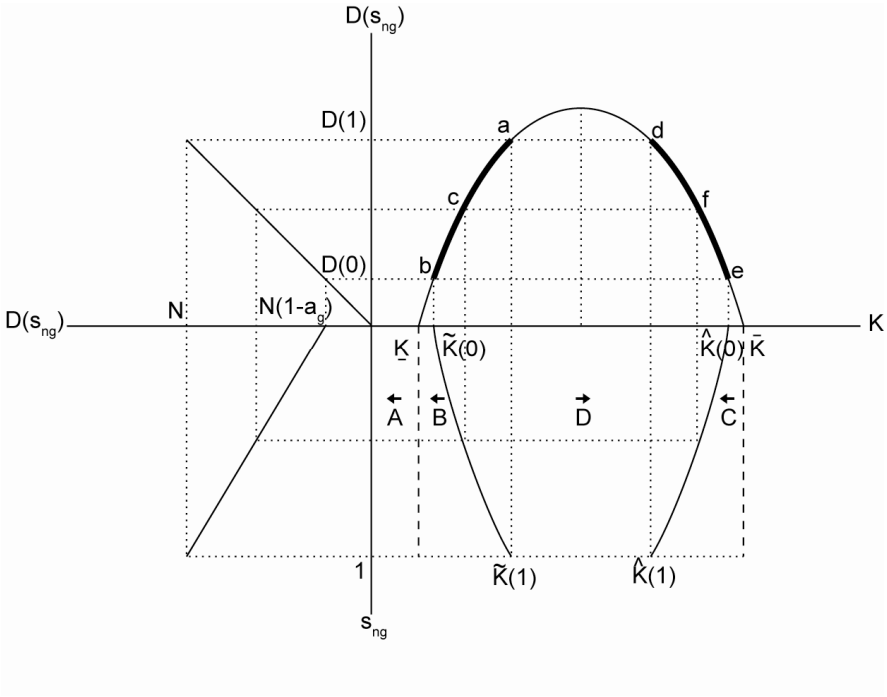

Fig. 5.3. Resource dynamics of the unilateral commitment model.

5.3.3. Dynamics of the combined system

In this section both natural capital and the composition of the population are endogenous, and, therefore, dynamics are determined by the system formed by equations 5.4 and 5.5. As usual, we first explore the steady states (s_{ng},K) of our dynamic system. It is shown that in this system, as in Osés and Viladrich (2007), and

opposite to Sethi and Somanathan (1996), the resource dynamic play a key role in determining the population composition in the steady state.

Superimposing figure 5.2.b and the fourth quadrant of figure 5.3 yields figure 5.4, where different scenarios are represented in terms of the number and stability of the steady states. Existence and stability of different types of equilibria for the combined system are formalized in a series of propositions (proofs can be found in appendix 5.I).

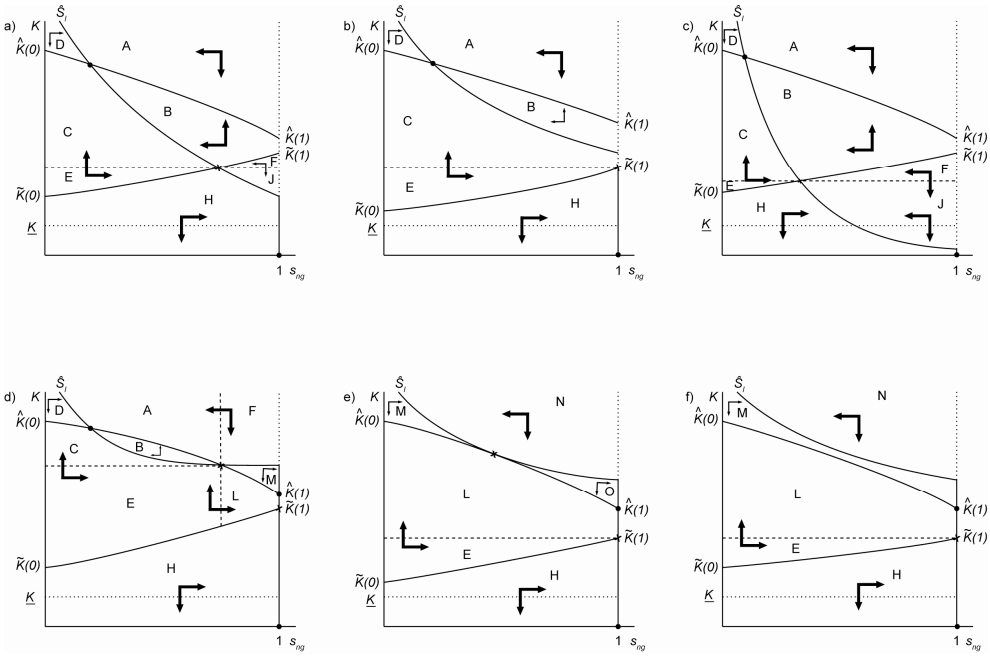

Fig. 5.4. Dynamics of the combined system of the unilateral commitment model.

Proposition 5.1: *Whenever there exists a value of* $s_{ng} \in (0,1)$ *such that the isocline of the population shares at least one point with any of the isoclines of the natural capital, a mixed equilibrium of the combined system exists. Given that a heterogeneous equilibrium exists, conditions for that equilibrium to be asymptotically locally stable are F'(K)<0 and* $\frac{\partial \delta(s_{ng}, K)}{\partial s_{ng}} + \frac{N \cdot a_g}{F'(K)} \frac{\partial \delta(s_{ng}, K)}{\partial K} > 0 \cdot$

Figures 5.4.a-e represent scenarios where at least one heterogeneous equilibrium exists, whereas in figure 5.4.f no heterogeneous equilibrium exists. Stable (unstable) equilibria are represented by a solid dot (a cross). Condition *F'(K)<0* says that stable heterogeneous equilibriums must belong to the isocline $\hat{K}(s_{ng})$,

whereas the second condition in proposition 5.1 implies that a marginal increase in the proportion of non-green firms has a negative effect on these firms' profits compared to the green firms' profits ($\partial(\pi_{ng}-\pi_g)/\partial s_{ng}<0$). It also implies that $\hat{K}(s_{ng})$ must be flatter than the isocline of the population at the intersection point[16].

Whenever a stable heterogeneous equilibrium exists, areas A to C in figures 5.4.a-d represent the set of initial situations for which convergence towards the stable heterogeneous equilibrium is guaranteed, i.e., its basin of attraction. Area A describes values of the system for which the natural resource is abundant and the number of firms undertaking voluntary environmental abatement is small. Therefore, firms can charge high price premiums for green differentiation when undertaking voluntary environmental initiatives, $\delta(\cdot)$, which are higher than abatement costs to becoming green. As a result, the number of green firms increases. In addition, given that area A is above $\hat{K}(s_{ng})$, total damage exercised by users exceeds the replenishment capacity of the resource, $D(s_{ng})>F(K)$, and, consequently, the stock of natural capital diminishes. The initial scenarios in area B are similar to those in are A, but in B the stock of natural capital is lower, thus the replenishment capacity of the resource is higher and the resulting dynamic is an increasing stock of natural capital. In area C, as in B, environmental damage is below the replenishment capacity of the resource but, in this case, the combination of the stock of natural capital and the proportion of green firms in the population does not create sufficiently high price premiums for green differentiation. Thus, green firms have incentives to abandon their environmental efforts and become non-green. Area D presents an extreme situation in which both environmental quality and the proportion of green firms are very high. For values in area D, there are too many green firms in the system for green differentiation to be profitable, and hence the number of green firms diminishes. Further, the high stock of natural capital in D determines a small replenishment capacity of the resource which is actually smaller than damage derived from recreational uses. Therefore, environmental quality is reduced.

For other sets of initial values, such as those included in areas *E* to *G*, the qualitative analysis does not allow us to unambiguously determine the equilibrium towards which trajectories converge. In any other areas, the system inevitably converges to a stable all-non-green equilibrium. Existence and stability of all-non-green homogeneous equilibria are presented in proposition 5.2.

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[16] Since condition (1.ii) is equivalent to $-\dfrac{\partial\delta(\cdot)/\partial s_{ng}}{\partial\delta(\cdot)/\partial K}>\dfrac{N\cdot a_g}{F'(K)}$, for $F'(K)<0$.

Proposition 5.2: *The point (s_{ng},K)=(1,0) is an asymptotically locally stable equilibrium with all-non-green firms. There exist homogeneous equilibria with all-non-green firms and positive natural capital whenever the isocline of the population shares one point with any of the isoclines of the natural capital for s_{ng}=1. Given that an homogeneous equilibrium with all non-green firms and positive natural capital exists, it is a necessary and sufficient condition for the equilibrium to be asymptotically locally stable that F'(K)<0 and $\delta(1,K)<c(a_g)$.*

This implies stronger conditions than in Osés and Viladrich (2007) where all-non-green equilibria are always stable except in the special case when $\tilde{K}(1) = \hat{K}(1)$. In our case, for these equilibria to be stable it is necessary that the slope of the resource replenishment function is negative (*F'(K)<0*) and that a shift to the green option is not profitable even when the potential premium is the highest for a given level of capital ($\delta(1,K)<c(a_g)$).

Therefore, there are two relevant thresholds of natural capital, which affects the stability of equilibria for all-non-green populations. First, below $\underline{K}$, the natural capital is inevitably depleted regardless of the damage exercised by users. The existence of this threshold guarantees that (1,0) is always asymptotically locally stable. Areas H and J in figure 5.4 determine values of the system for which the system necessarily evolves towards the equilibrium (1,0). The second relevant threshold for stability is K^{MIN}. Recall that the value of natural capital K^{MIN} is the threshold above which users of the natural resource start to find it worth becoming green when starting from an all-non-green situation. It is necessary that $K^{MIN} > \hat{K}(1)$ for an asymptotically locally stable equilibrium with all-non-green firms and positive natural capital to exist. Figures 5.4.d to f represent situations in which these equilibria are stable. In these figures, areas L to O determine the areas of convergence to this equilibrium.

Lastly, opposite to Osés and Viladrich (2007) and as stated in lemma 1, all-green homogeneous equilibria are not stable. This is because $\hat{S}_1$ approximates asymptotically to the vertical axis. This asymptotic behavior is independent of the dynamics of natural capital.

Proposition 5.3. *Endogenizing natural capital does not change the stability conditions for all-green equilibria. These are always unstable.*

In sum, in the combined system, there always exists an asymptotically locally stable all-non-green equilibrium in which the resource is depleted, (1,0). In addition to this equilibrium: (i) an asymptotically locally stable all-non-green homogeneous equilibrium can exist when $\hat{K}(1)$<K^{MIN,} for which the resource is not depleted, (1, $\hat{K}(1)$); (ii) an asymptotically locally stable heterogeneous equilibrium can exist when there exists a $s_{ng} \in (0,1)$, for which $\hat{S}_1 = \hat{K}(s_{ng})$ and the slope of $\hat{S}_1$ is higher than the slope of $\hat{K}(s_{ng})$ in absolute terms.

The existence of a basis of attraction to the heterogeneous green-non-green equilibrium only under certain situations is consistent with the observation that firms making use of some natural CPRs engage in voluntary initiatives whereas firms using other CPRs do not. The historical evolution of tourism destinations shows that, initially, the tourism industry had no particular concern for its environmental impacts, thus being in an all-non-green equilibrium. Tourism expansion has generally been described as accompanied by congestion, degradation of natural assets, weak management of wastes and effluents and other negative impacts (for some examples, see Knowles & Curtis, 1999; Morgan, 1991; Tisdell, 2001). The homogeneous all-non-green firms equilibrium has shown itself to be a stable equilibrium of the system in some destinations where environmental concerns have not been introduced, whereas in other destinations the population has evolved to include a certain proportion of green firms. When the all-non-green equilibrium is unstable, the introduction of a green strategy by a single firm entails a trajectory that converges to the equilibrium with a heterogeneous composition of the population. This conforms to the increasing environmental concerns shown in some destinations, in spite of the fact that such concerns are embraced only by a certain share of its tourism firms (UNEP, 1998; WTO, 2002).

5.4. The ecolabel and unilateral commitment model

This section extends the model presented in section 5.3 to introduce a new strategy into the system: an ecolabel to which firms can voluntarily adhere. Conventional practice in evolutionary game theory is to conceptualize the creation of new strategies as exogenous mutations with a very small initial frequency (Nowak et al., 2004). This makes sense in biological games in which populations evolve through mutations, and in some economic games, such as innovative entrepreneurial behavior. However, other scenarios for initial membership to the ecolabel are more reasonable in our game. The process of the creation of an ecolabel is neither random nor the result of individual entrepreneurial behavior. Instead, it seems more realistic to assume that the design of the ecolabel is a process in which subsets of firms undertake an active role in collaboration with other stakeholders, such as the government or non-government organizations. For example, in 2002, it was reported that 2/3 of the existent ecolabels in tourism were coordinated with multi-stakeholder groups representing tourism, environmental, social and consumers' interests (WTO, 2002). Moreover, empirical data show that voluntary tourism initiatives are led by tourism NGOs (in 32% of the cases), government organizations (20%), private companies (15%), and other NGOs (33%) (WTO, 2002). Further, industry associations also exhibit environmentally pro-active behavior, as shown by 11 out of the 28 ecolabels in the UNEP (1998) study being promoted by industry associations.

It is beyond the scope of this paper to model the collective action processes by which firms coordinate among themselves and/or with other stakeholders to create an ecolabel. We rather analyze the endogenous responses of individual firms to the exogenous creation of an ecolabel in the system. We will show that this response critically depends on the number of firms that act as promoters of the ecolabel, the type of firms acting as promoters, the initial composition of the population, the institutional design of the ecolabel and the initial level of environmental quality.

As in section 3, we first present the model and analyze the population dynamics and the dynamics of natural capital separately. After this, the combined system is studied.

When extending the model to consider the existence of an ecolabel for the population of firms making use of the CPR, we assume that firms that adhere to the ecolabel incur higher abatement costs in exchange for the capacity to charge a higher price. The payoff function that substitutes equation 5.2 is now equation 5.6:

$$\pi_i = q_i[x + \delta(s_{ng}, K)\cdot g(a_i) + R(s_l, K)\cdot l(a_i) + \gamma(K)] - c(a_i) - co\,,$$
$$i = ng, g, l \tag{5.6}$$

$$R(0, K) = 0 \text{ , and } \frac{\partial R(\cdot)}{\partial s_l} > 0\,,\ \frac{\partial^2 R(\cdot)}{\partial s_l^2} < 0$$

$$R(s_l, 0) = 0\text{, and } \frac{\partial R(\cdot)}{\partial K} > 0\,,\ \frac{\partial^2 R(\cdot)}{\partial K^2} < 0$$

$a_l > a_g > a_{ng}$

where $a_i \in \{a_{ng}, a_g, a_l\}$ are abatement efforts, with $a_l \in (0,1)$ being the one required by the ecolabel rules, and $s_i \in \{s_{ng}, s_g, s_l\}$, $\sum s_i = 1$ represents the proportion of each of the three kinds of firms in the population. $l(a_i) = \{0,1\}$ is a dummy variable taking the value 1 for ecolabel firms and 0 otherwise. Abatement efforts undertaken by non-green firms are normalized to zero as in the previous version of the model.

According to the previous expression, payoff functions of green and non-green firms do not change compared to the model in section 3. Regarding the firms that adhered to the ecolabel, we assume that they obtain the same price premium based on differentiation as those firms that unilaterally carry out abatement activities. In addition, ecolabel firms can charge an additional price premium *R(·)* that depends upon the reputation of the ecolabel. We assume that this premium depends on the number of firms adhered to the initiative and on the environmental quality of the CPR. As explained in section 5.2, as more firms adhere to the ecolabel, the ecolabel gains greater funding capacity to provide the exogenous services that in-

crease its reputation premium. As to the positive dependence on environmental quality, the arguments are the same as those put forward in section 3 for $\delta(\cdot)$. We also reasonably assume that the premium is zero when there is no firm participating in the initiative and when the natural resource is exhausted.

As already noted, it is reasonable to assume that those firms that adhere to the ecolabel have to bear higher environmental costs compared to firms following other strategies. One reason for this is that their abatement efforts are usually greater since, according to the international standard for eco-labels (ISO 14024), these voluntary initiatives should include the precondition of the applicant's compliance with environmental legislation and show measurable and significant differences in environmental impact compared to non-certified licensees (WTO, 2002). Apart from this, there are other costs associated with ecolabel membership, such as certification and licensing fees to be paid to the ecolabelling agency for awarding the ecolabel to firms (Anton et al., 2004; Arimura, Hibiki, & Katayama, 2008; Sasidharan et al., 2002), and greater coordination activities or employee training and product and process improvement (Anton et al., 2004). For simplicity, we do not model these other costs explicitly.

The population dynamics determined by a two-dimensional dynamic system in the variables s_{ng} and s_l are shown in equations 5.7 and 5.8:

$$\dot{s}_i = s_i\left(\pi_i - \bar{\pi}\right),\ i=l,ng \tag{5.7}$$

$$\left.\begin{aligned} \dot{s}_{ng} &= s_{ng}[-s_l\left(R(s_l,K)-\left(c(a_l)-c(a_g)\right)\right)-(1-s_{ng})\left(\delta(s_{ng},K)-c(a_g)\right)] \\ \dot{s}_l &= s_l[s_{ng}\left(\delta(s_{ng},K)-c(a_g)\right)+(1-s_l)\left(R(s_l,K)-\left(c(a_l)-c(a_g)\right)\right)] \end{aligned}\right\} \tag{5.8}$$

where average payoffs are now $\bar{\pi} = s_{ng}\pi_{ng} + s_l\pi_l + (1-s_{ng}-s_l)\pi_g$.

As to the natural resource, we assume the same dynamic equation 5.5, and replenishment function as were put forth in section 5.3. The damage function now takes into account the existence of a third strategy with differentiated abatement levels, and it therefore becomes the following:

$$D(s_{ng},s_l) = N[(1-a_g) + s_{ng}a_g - s_l(a_l - a_g)] \tag{5.9}$$

5.4.1. Population dynamics

When we consider that natural capital is exogenous, the behavior of the system is solely determined by equation system 5.8. The first quadrant of figure 5.5 represents a possible configuration of steady states of the system.

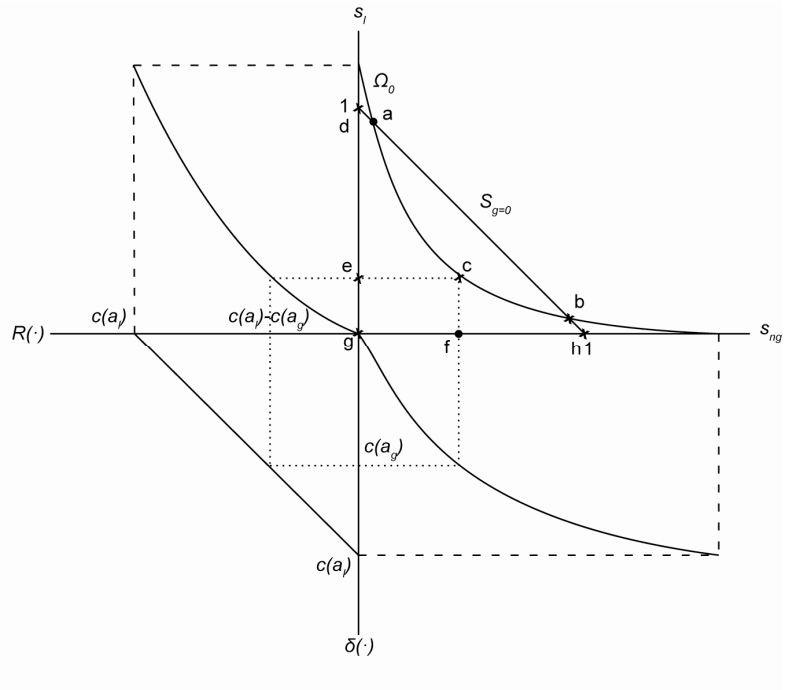

Fig. 5.5. Equilibrium configuration of the population in the ecolabel and unilateral commitment model.

This figure represents a case where all possible equilibria[17] are present. Line $S_{g=0}$ represents situations where $s_g = 0$ and delimits, jointly with the axis, the feasible region. The curve Ω_0 represents compositions of the population for which payoffs for ecolabel firms and non-green firms are equal. This curve is obtained using the $R(\cdot)$ and $\delta(\cdot)$ functions (second and fourth quadrants, respectively) and the condition of equality between payoffs of ecolabel and non-green firms (third quadrant).

[17] In this section we only deal with hyperbolic equilibria. Non-hyperbolic equilibria are considered when presenting the sensitivity and bifurcation analysis at the end of this section.

Other configurations of the parameters can lead to a different number of steady states, as is shown in figure 5.6. Still, there are several equilibria that are always present, as is stated in the following lemma (proofs to all lemmas in this section are included in appendix 5.II):

Lemma 5.3: *Homogeneous all-ecolabel, all-green and all-non-green firms are always possible equilibria. An all-ecolabel equilibrium is asymptotically locally stable when* $R(1,K) > c(a_l)$*; an all-green equilibrium is always unstable; and an all-non-green equilibrium is asymptotically locally stable when* $\delta(1,K) < c(a_g)$.

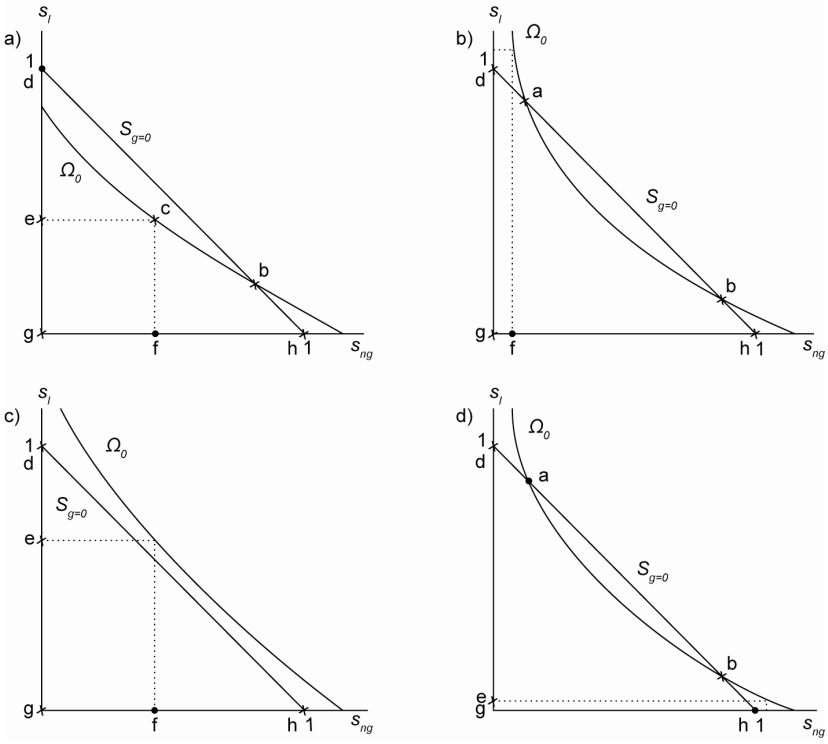

Fig. 5.6. Other equilibrium configurations of the population in the ecolabel and unilateral commitment model.

Given the nature of the replicator dynamics at points *d*, *h* and *g* of figures 5.5 and 5.6, the system is in equilibrium. Figure 5.6.a represents the optimistic case[18] in which *d* is a stable equilibrium of the system, whereas figure 5.6.d represents a stable equilibrium *h*. Note that the condition for a homogeneous all-non-green firms equilibrium being stable does not vary with the introduction of the ecolabel.

The relevance of an all-ecolabel equilibrium should be cautiously considered since there is no evidence supporting full adherence to ecolabels in tourism. This can be attributed either to systems being in early stages of dynamic evolutions that eventually would reach a stable point *d*, or to costs associated with certification of ecolabels being above the $c(a_l)=R(1,K)$ threshold. The former hypothesis could be supported by more than half of the ecolabels that were identified by the WTO (2002) as operating for less than four years. This is a rather short time period for the diffusion of a new strategy. Thus, it could be the case that some ecolabels could eventually embrace all firms of their target population. It has been defended that the end point in the evolution of a tourism ecolabel is when it becomes a routine part of normal business relations between firms and customers so that connotations of a label are lost and the criteria of the ecolabel are perceived as a requirement (Buckley, 2002). Buckley (2002) notes that, unlike the case of tourism, there are standards of ecolabels on manufactured consumer goods that are required by consumers or adopted by legal mandates in many countries.

In addition to homogeneous populations, the system can have equilibria where two strategies coexist in the long run. Conditions for the existence and stability of these equilibria are presented in lemmas 5.4 and 5.5.

Lemma 5.4: *An equilibrium of the population composed of non-green and green firms exists if there exists a* $s_{ng} \in (0,1)$ *such that* $\delta(s_{ng},K)=c(a_g)$. *Given that it exists, it is always asymptotically locally stable and it is monotonically convergent. An equilibrium of the population composed of ecolabel and green firms exists if there exists an* $s_l \in (0,1)$ *such that* $R(s_l,K)=c(a_l)-c(a_g)$. *Given that it exists, it is always unstable. Equilibria of the population composed of ecolabel and non-green firms exist if* Ω_0 *and* $S_{g=0}$ *share at least one point. This is a locally asymptotically stable equilibrium if* $\delta(s_{ng},K)<c(a_g)$ *and* $\frac{\partial R(\cdot)}{\partial s_l} < \frac{\partial \delta(\cdot)}{\partial s_{ng}}$ *and it is always monotonically convergent.*

[18] Throughout the paper we will be labeling cases as optimistic or successful when the ecolabel can survive in the long run. However, it must be noted that evaluating a voluntary program on the basis of participation alone is inappropriate. Even with very high participation rates, aggregate abatement can be very low if abatement by each participating firm is low (Alberini et al., 2002).

Figure 5.6.c represents a pessimistic case in which Ω_0 never crosses $S_{g=0}$. In this case, there is no other stable equilibrium but *f*, which corresponds to the heterogeneous equilibrium of the system in section 3.1 composed of green and non-green firms, as expressed in lemma 5.1. Then, in figure 5.6.c, the ecolabel has no possibility of success since it does not change the long-term behavior of the population with respect to the situation where only unilateral commitments were possible. In figures 5.5 and 5.6, points *a* and *b* are equilibria where heterogeneous populations of ecolabel and non-green firms exist. Point *b* in figure 5.5 is an unstable equilibrium, whereas *a*, where the proportion of ecolabel firms is higher, is stable. However, it can also be the case that point *a* is unstable as represented in figure 5.6.b. Consequently, figure 5.6.b represents another pessimistic case in which, even though equilibria where a positive proportion of firms adhere to the ecolabel exist, they are not stable.

Finally, lemma 5.5 deals with the case of heterogeneous equilibrium with all three kinds of agents:

Lemma 5.5: *A heterogeneous equilibrium where the population is composed of ecolabel, green and non-green firms exists if the values of* s_l *such that* $R(s_l, K) = c(a_l) - c(a_g)$ *and* s_{ng} *such that* $\delta(s_{ng}, K) = c(a_g)$ *meet the condition* $0 < s_l + s_{ng} < 1$. *This equilibrium is a saddle point.*

Point *c* in figure 5.5 represents this equilibrium. This is an equilibrium because at point *c,* profits from all three strategies are equal. Point *c* belongs to curve Ω_0, and thus, in it, $\pi_l = \pi_{ng}$. In addition, as determined in the second quadrant, in point *c,* the reputation strictly compensates for the extra cost of being an ecolabel with respect to being green ($R(\cdot) = c(a_l) - c(a_g)$), which determines $\pi_l = \pi_g$. Moreover, as can be seen in the fourth quadrant, premiums from environmental differentiation strictly compensate for abatement costs of the unilateral commitment ($\delta(\cdot) = c(a_g)$). Consequently, $\pi_g = \pi_{ng}$. Even though this equilibrium can exist, it is just conditionally stable and there is only one trajectory that leads to it (the stable arm). Equilibrium *c* plays the important role of delimiting the basin of attraction for equilibria with and without ecolabel membership, as is shown in the following analysis.

Dynamics: some scenarios of the creation of an ecolabel.

Let us now explore some scenarios that seem appropriate when analyzing the institutional change that implies the creation of an ecolabel in a tourism region. These scenarios would be related to invasibility concerns in evolutionary game theory. When an equilibrium is locally asymptotically stable, then in every open neighborhood of this equilibrium, every path sufficiently close to the equilibrium converges to it (Friedman, 1998; Nowak et al., 2004). However, if the initial fre-

quency of the new strategy exceeds a certain "invasion barrier," the new strategy can spread and eventually eliminate the original strategies (Nowak et al., 2004). This idea of a minimum number of firms necessary to join a voluntary agreement, which is endogenously determined, is similar to the analysis undertaken by Dawson and Segerson (2008), which the authors relate to the notion of the "minimum contributing set" advocated as a solution to the public goods problems. We consider in this section some initial states of the creation of the ecolabel, in a non-exhaustive manner, and analyze the resulting dynamics. Argumentation on dynamics is based on figure 5.7, where a stable heterogeneous equilibrium exists with ecolabel firms.

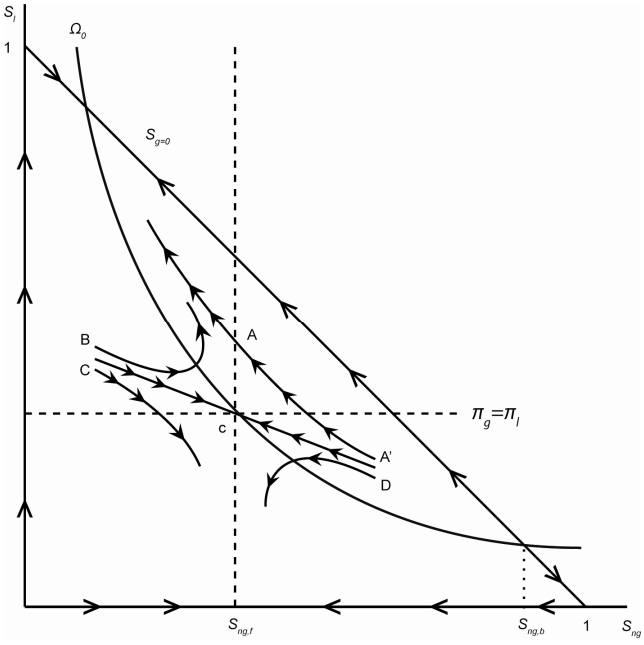

Fig. 5.7. Population dynamics of the ecolabel and unilateral commitment model.

First, let us start by considering an initial system that has reached equilibrium *f*, where green and non-green strategies coexist. In this situation, let us assume that, as reported by Mihalic (2000), some tourism firms realize that unilateral commitments are of limited marketing value in fostering environmental competitiveness, and consequently they consider the option of obtaining recognized certification of their environmental behavior. Consequently, let us assume that a subset of the green firms in the system coordinate to create an ecolabel, possibly with the participation of a third party that gives written assurance of conformance to the specified requirements to join the initiative. This picture is consistent with the observation that the tourism industry has usually preferred to develop its own certification systems (Font, 2002). Some ecolabels are actually promoted by clusters of envi-

ronmentally sensitive firms whose aim is to improve the perception of the demand market of their voluntary action (UNEP, 1998; WTO, 2002). In figure 5.7, an ecolabel created by a coordination process among green firms is represented by a vertical movement from *f* of the population configuration. The proportion of non-green firms does not vary whilst the proportion of ecolabels increases. In that case, a necessary and sufficient condition for the ecolabel to succeed (that is, for the system to converge to the equilibrium with ecolabel firms, *a*) is that the proportion of promoters of the ecolabel is above the value of s_l for which $R(\cdot)=c(a_l)-c(a_g)$, such as point A in figure 5.7. This requirement implies that for the ecolabel to succeed, it must be more attractive than unilateral commitments from the very onset. That is to say, a minimum threshold of promoters needs to be achieved for the ecolabel to succeed. If this critical level is surpassed, it becomes profitable for additional green and non-green firms to join the ecolabel.

A different situation occurs when coordination to create the ecolabel takes place between a subset of green and non-green firms starting again from *f*. In this case, the initial situation, once the ecolabel is created, would be some point in the area to the left of *c*. For instance, this could be a realistic description of situations in which the ecolabel is launched by an industry association with green and non-green firms (e.g., an association of firms making use of a natural CPR). As explained in section 2, the reputation of an ecolabel depends on the credibility of the information that is provided to the demand market. Subsequently, green firms in the association might be willing to pressure the association to become a promoter of the certification scheme if the tourism association has higher credibility in the sector than other independent third parties. If green firms are dominant in the association, they might be able to force the promotion of the ecolabel by this organization and even make the association force the adherence of non-green firms (for instance, making membership of the association conditional to the adherence to the ecolabel) in order to obtain the critical mass that, as it has been shown, is crucial for the ecolabel's success, or to fully identify the association with the ecolabel. A priori, it could be thought that this second scenario would lead the system to equilibrium *a* more easily than in the first scenario, but this is not the case. It is still possible that the new configuration of the population is on a trajectory that ends in equilibrium *a*, as is the case with point B in figure 5.7. However, it is also possible that the population moves from *f* to levels of s_l above the s_l for which $R(\cdot)=c(a_l)-c(a_g)$, but that the system moves back to *f*, such as in the trajectory passing by point C. In this scenario, requirements for the ecolabel's not collapsing back to *f* are more stringent than when the promoting firms are only green. This is because, by including non-green firms in the promotion of the ecolabel, price premiums from green differentiation $\delta(\cdot)$, which are common to both environmentally sensitive strategies, decrease. This makes green and ecolabel options less profitable compared to non-green behavior and creates individual incentives to abandon the ecolabel despite its being a better option than unilateral commitments.

Other possible scenarios consider baseline situations where the system is not at point *f* or, put in a different way, where the system developed in section 5.3 is not

in equilibrium. Different situations may arise depending on the baseline composition of the population. Thus, as a third case, let us consider that the ecolabel is created in a very initial phase along the movement from *h* to *f*, more precisely, it is created when $s_{ng,b}<s_{ng}<1$. For example, it could be the case that the CPR under analysis is in a developing country where environmental considerations are not yet widely adopted, with unilateral commitments being present but very limited. In this context, firms might decide to search for private assistance in improving the green image of the region or, alternatively, international organizations might come to the region due to concern about excessive environmental degradation. These external agents might import knowledge from developed countries, where ecolabels are widely used in tourism (UNEP, 1998; WTO, 2002), and propose the creation of a certification program with the purpose of inducing the industry to become more environmentally sensitive. In this context, even in the very favorable situation where these organizations are capable of persuading all green firms to join the certification program, this will not prosper. In this case, the composition of the population moves vertically to $S_{g=0}$. The resulting dynamic converges to an all-non-green firms unstable equilibrium. Not only has the ecolabel failed to get a stable number of participants, but the premature creation of the certification program has also truncated the incipient dynamic of unilateral commitments[19]. The model, therefore, shows that if introduction of certification schemes along the spread of greener behavior in a developing tourism region comes too early, it might be a motivation for its limited success (almost 80% of all ecolabels identified by WTO, 2002 were operating in Europe, and only a few in less developed countries).

This result varies when we consider a fourth case in which the system is moving from the all-non-green equilibrium toward *f*, but has evolved further than in the previous scenario $s_{ng,f}<s_{ng}<s_{ng,b}$. In this case, if the promoting institution is capable of persuading all of the green firms in the region to adhere to the ecolabel, the system moves to $S_{g=0}$ and then along $S_{g=0}$ to the stable equilibrium with the ecolabel (equilibrium *a*). A similar pattern of behavior can arise even if only a subset of green firms act as promoters. To show this, let us consider point A' in figure 5.7. At this point, firms that undertake unilateral commitments obtain higher profits than those adhering to an ecolabel, and both strategies are more profitable than non-green. As a result, the proportion of non-green firms decreases since firms move to environmentally-friendlier strategies. During this process, the ecolabel achieves a critical mass of members to become the preferred strategy in the system, and its membership eventually stabilizes at a positive value[20]. The dynamics are, however, dramatically different with a slightly lower level of promot-

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[19] Given the instability of the homogeneous all-non-green firm situation, it could be expected that the population would eventually again move left along the horizontal axis.

[20] The same qualitative analysis arises when the initial number of promoters already reaches this critical mass, that is, when the initial point is located above $R(\cdot)=c(a_l)-c(a_g)$.

ers as at point D. The ordering of profits is the same, and the ecolabel membership increases in a first stage fed by formerly non-green firms. However, a critical mass to make ecolabelling a preferred option compared to unilateral commitment is never obtained, so the system converges to equilibrium *f* and the ecolabel collapses. Notice that there is a knife-edge initial situation between A' and D for which the system is placed in the stable arm that converges to the equilibrium *c*, where the three types of strategies coexist[21].

Finally, prior to the creation of the ecolabel, the system may be on the left of point *f*. This may happen, for instance, due to an exogenous drop in the level of natural capital[22] (for instance, an oil spill in a coastal tourism area or a fire in a natural hiking area), since this would shift equilibrium *f* to the right. Facing this shock, some firms and/or public agencies may consider the possibility of creating an ecolabel as an instrument to counteract the decline in the environmental image of the region. The creation of the ecolabel puts the system at an initial point belonging to areas to the left of *c*. Thus, it is not sufficient for the proportion of promoting firms to be above $R(\cdot)=c(a_l)-c(a_g)$ since, although the ecolabel is a more profitable option than unilateral commitment, the ecolabel does not attract new membership.

Sensitivity and bifurcation analysis

As has been shown, the model admits a wide variety of scenarios in terms of number and stability of equilibria. A sensitivity analysis is therefore necessary to determine how the dynamic behavior of the system depends upon the value of critical parameters of the model. Specifically, we focus on two parameters relevant for institutional design and policy implications, namely a_l and a_g. a_l is an important component of the design of the ecolabel, and a_g, as explained below in section 5.4.3, can be considered to be dependent on the stringency of environmental regulation[23]. It turns out that several local bifurcation values of both parameters can be identified that imply dramatic changes in the characteristics of the set of equilibria (Gandolfo, 1996:pp.469-502; Lorenz, 1989).

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[21] Notice that this is not an optimal control problem so there is no transversality condition to constrain the choice of the initial point and, therefore, nothing guarantees that the system will be placed in the stable arm that leads to equilibrium *c*.

[22] Natural capital is endogenized in section 5.3.

[23] A more policy-oriented bifurcation analysis is carried out in the model with endogenous *K*.

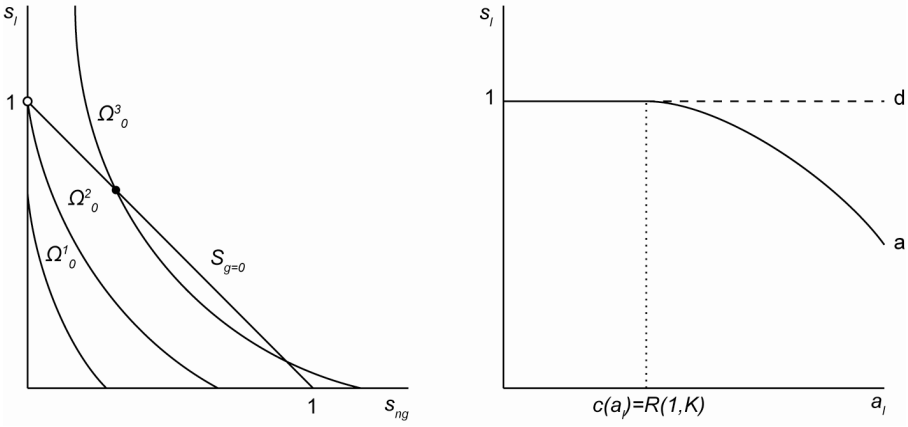

Fig. 5.8. Sensitivity analysis of the population to a_l. Bifurcation in equilibrium *d*.

Let us first consider the consequences of variations in the abatement levels required to join the ecolabel, a_l[24]. We start from a situation in which a_l is low enough to make the homogeneous all-ecolabel equilibrium *d* stable, as represented in figure 5.6.a. As shown in figure 5.8, increases in $c(a_l)$ shift the curve Ω_0 to the right, increasing the intersection point with the vertical axis (where $R(s_l,K)=c(a_l)$), until curve Ω_0 crosses the vertical axis precisely at $s_l=1$, which occurs for $c(a_l)=R(1,K)$. This is a bifurcation value of the parameter since for that $c(a_l)$ the equilibrium *d* becomes non-hyperbolic[25]. For larger values of the parameter, equilibrium *d* becomes unstable and a new stable equilibrium, *a*, emerges[26]. Therefore, a transcritical bifurcation occurs, i.e., a new equilibrium emerges that takes the stability properties of the equilibrium that was first in place, which loses its stability (Gandolfo, 1996pp.473-475). The result is that the long run behavior of the population moves from one stable equilibrium in which all firms join the ecolabel to a new equilibrium in which only a proportion of firms join the certification scheme.

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[24] This analysis can be directly extended to changes in any other cost related to ecolabel membership.

[25] That is to say, as shown in appendix II, for this parameter value, the determinant of the Jacobian becomes zero.

[26] We will assume that $\partial(s_{ng},K) < c(a_g)$ when evaluated in *d* and *a* is satisfied throughout the bifurcation analysis unless otherwise stated.

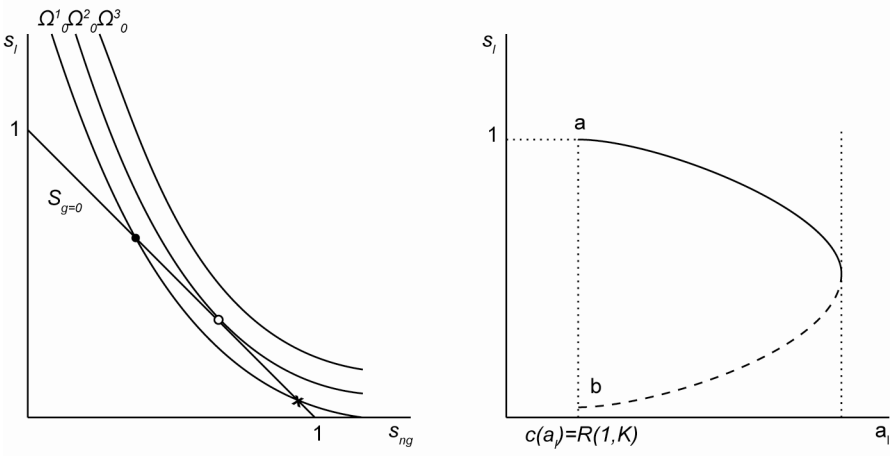

Fig. 5.9. Sensitivity analysis of the population to a_l. Bifurcation in equilibrium *a*.

A more habitual concern in ecolabelling than full adherence of firms is to achieve a positive proportion of adhered firms in the long run (Font, 2002; WTO, 2002). Figure 5.9 starts from the endpoint in figure 5.8, where *a* is a stable equilibrium and *b* is an unstable one. Both *a* and *b* are populations composed of ecolabel and non-green firms. As abatement requirements by the ecolabel further increase, curve Ω_0 shifts to the right until it becomes tangent to $S_{g=0}$. At this tangency point, equilibria *a* and *b* collapse and become a unique non-hyperbolic equilibrium. The bifurcation value of a_l satisfies $c(a_l) = \delta[(1-s_l),K] + R(s_l,K)$ and $-\frac{\partial \delta[(1-s_l),K]}{\partial s_l} = \frac{\partial R(s_l,K)}{\partial s_l}$. For larger values of the parameter a_l, there is no equilibrium with ecolabel and non-green firms, and therefore, the ecolabel cannot prosper. This then constitutes a saddle-node or fold bifurcation (Gandolfo, 1996pp.472-473).

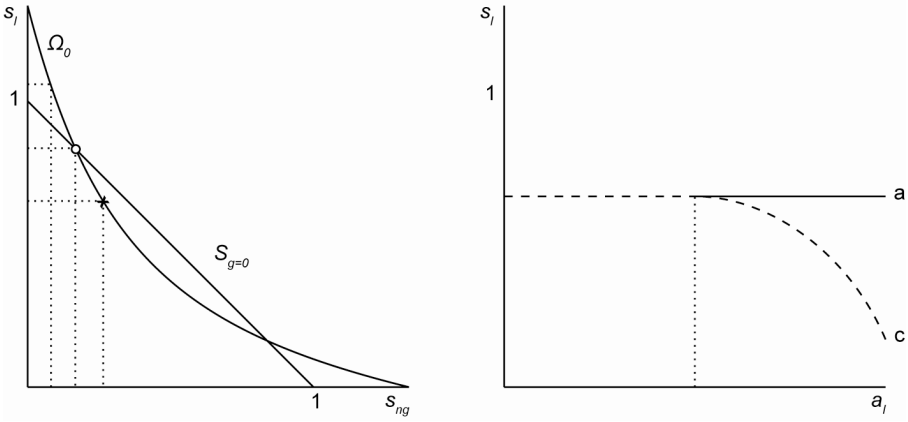

Fig. 5.10. Sensitivity analysis of the population to a_g.

A third bifurcation analysis, represented in figure 5.10, involves parameter a_g. Let us consider an initial situation, qualitatively identical to figure 5.6.b, where a_g is relatively low. In this situation, both equilibria with only ecolabel and non-green firms (equilibria *a* and *b*) are unstable, and the equilibrium where the three strategies coexist (equilibrium *c*) is out of the feasible region. As abatement costs required for obtaining the differentiation premium increase, point *c* moves along Ω_0 to the right. As a result, this point might eventually coincide with equilibrium *a* and become non-hyperbolic. The bifurcation value of a_g satisfies $c(a_g) = \delta[(1-s_l),K]$, $\delta[(1-s_l),K] = c(a_l) - R(s_l,K)$, and $-\frac{\partial \delta[(1-s_l),K]}{\partial s_l} > \frac{\partial R(s_l,K)}{\partial s_l}$. Increases in a_g above this point move equilibrium *c* inside the boundaries of the feasible region and equilibrium *a* becomes stable. Ecolabelling becomes a feasible option. This is, again, a transcritical bifurcation, as described in the first case, with the only difference being that here the existing equilibrium changes from unstable to stable.

5.4.2. Resource dynamics

We now analyze the dynamic behavior of natural capital for an exogenous composition of the population. The steady state condition, $D(s_{ng},s_l)=F(K)$, defines a relationship between the composition of the population and the stock of natural capital represented by isoclines $\tilde{K}(s_{ng},s_l)$ and $\hat{K}(s_{ng},s_l)$ in figure 5.11.

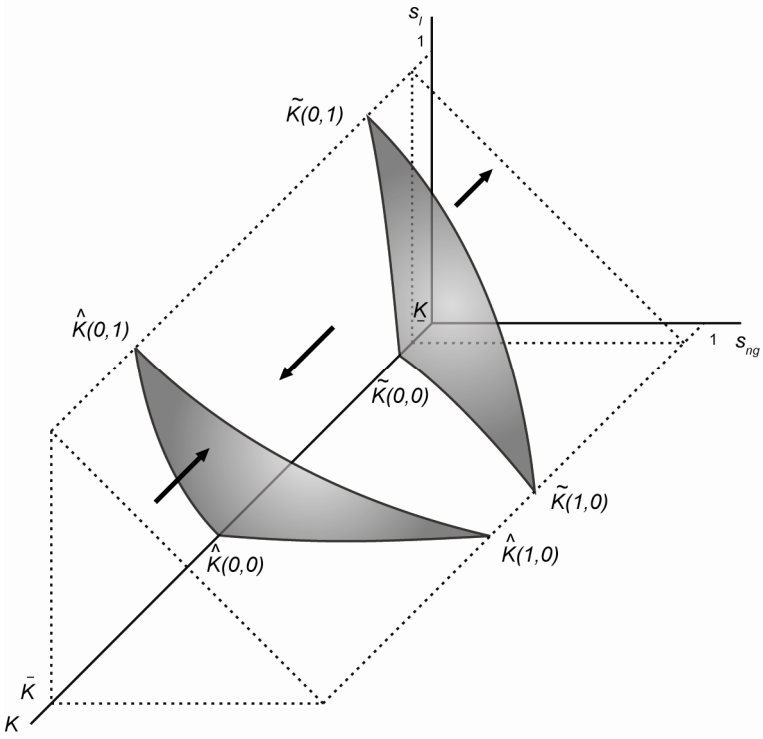

Fig. 5.11. Resource dynamics of the ecolabel and unilateral commitment model.

The shape of the bi-dimensional spaces $\tilde{K}(\cdot)$ and $\hat{K}(\cdot)$ responds to the assumption that $a_l > a_g > a_{ng}$ presented in section 5.4.1. The edges of the isoclines represent steady state values of the resource for different combinations of two out of the three possible strategies. For instance, the edges in the plane (s_{ng},K) are equivalent to the steady state relationships represented in figure 5.3, where only green and non-green strategies are considered. The edges at the plane (s_l,K) could be obtained with a figure similar to 5.3, but considering green and ecolabel strategies, and the edge belonging to the sloping plane of the prism defining the feasible region could be obtained in a similar way, but considering non-green and ecolabel strategies. Points within the interior of the region of the feasible space represent natural capital steady state values when the composition of the population comprises the three strategies.

The dynamics for an exogenous population are simple. For high (above $\hat{K}(\cdot)$) and low (below $\tilde{K}(\cdot)$) values of K, natural capital is decreasing, whereas it is increasing for intermediate values of K (between $\hat{K}(\cdot)$ and $\tilde{K}(\cdot)$). Therefore:

Lemma 5.6: *$\tilde{K}(s_{ng}, s_l)$ and $\hat{K}(s_{ng}, s_l)$ represent equilibrium spaces of the resource dynamics. $\tilde{K}(s_{ng}, s_l)$ represent unstable equibliria while $\hat{K}(s_{ng}, s_l)$ determine asymptotically locally stable equilibria.*

5.4.3. Dynamics of the combined system

In this section, both natural capital and the composition of the population are endogenous. The model is composed of the three-dimensional system defined by the system of equations 5.8 and the steady state condition $D(s_{ng},s_l)=F(K)$. Again, let us first explore the steady states of the combined system and later explore the sensitivity of the model to the values of the parameters and bifurcations.

Figure 5.12 presents a situation where all possible equilibria exist. This figure represents the isoclines of the natural capital $\hat{K}(\cdot)$ and $\tilde{K}(\cdot)$ and certain isoclines of the population, namely $\hat{S}_I, \hat{S}_{II}$ and $\hat{S}_{III}$. $\hat{S}_I$, comprise the representation in the plane (s_{ng},K) of the isocline of green and non-green firms first presented in figure 5.2. $\hat{S}_{II}$ is an isocline of the label and non-green firms population that is contained in the sloping plane of the prism defining the feasible region. Thus, it is composed of points where there are not green firms and where $\pi_l=\pi_{ng}$. For certain values of K, there are a pair of points of $\hat{S}_{II}$ corresponding to the heterogeneous equilibria *a* and *b* in the model with exogenous capital presented in figures 5.5 and 5.6. Finally, when we allow for endogenous natural capital, equilibrium *c* in figures 5.5 and 5.6 becomes a line that constitutes the isocline of the population $\hat{S}_{III}$ where the three strategies coexist.

Other configurations of equilibria are also possible, as shown in figure 5.13 (equivalent to figure 5.6 with exogenous K) and stated in propositions 5.3-5.6, that formally present existence and stability conditions (proofs can be found in appendix III).

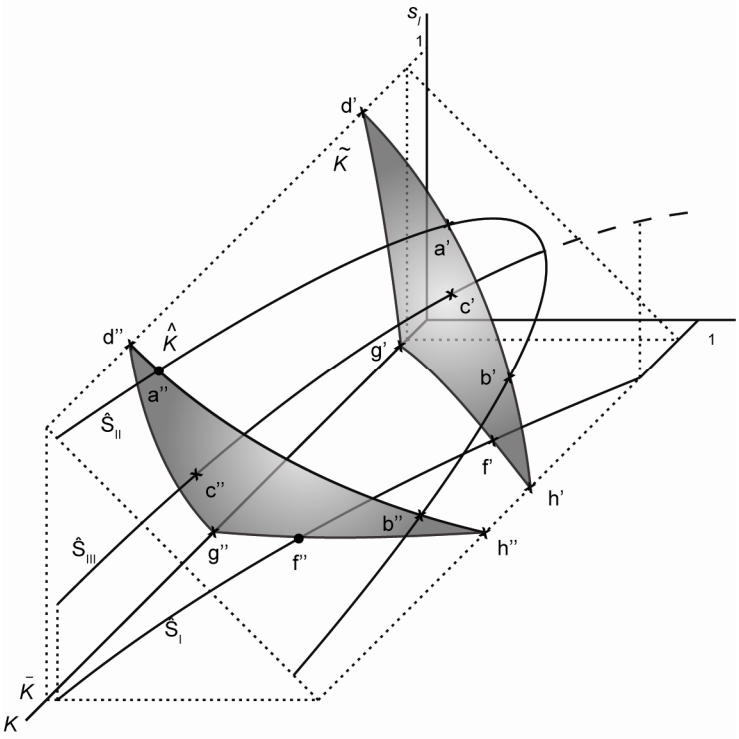

Fig. 5.12. Equilibrium configuration of the combined system in the ecolabel and unilateral commitment model.

First, given that homogeneous equilibria of the population constitute corner solutions of the system, existence conditions for these equilibria are identical to those of the model with exogenous *K* presented in lemma 5.3, whereas stability conditions are similar.

Proposition 5.4: *If a homogeneous equilibrium exists in the model with exogenous capital, it also exists in the combined system. The conditions for asymptotic local stability are those of the model with exogenous K plus F'(K)<0.*

Considering natural capital as an endogenous variable determines that stable homogenous equilibria only exist for the corner values of $\hat{K}(\cdot)$. Figures 5.13.a and d represent respectively the most optimistic and pessimistic cases in terms of the success of voluntary environmental initiatives. In 5.13.a the whole population is made up of members of an ecolabel, whereas in 5.13.d none of the firms engages in any voluntary environmental initiative.

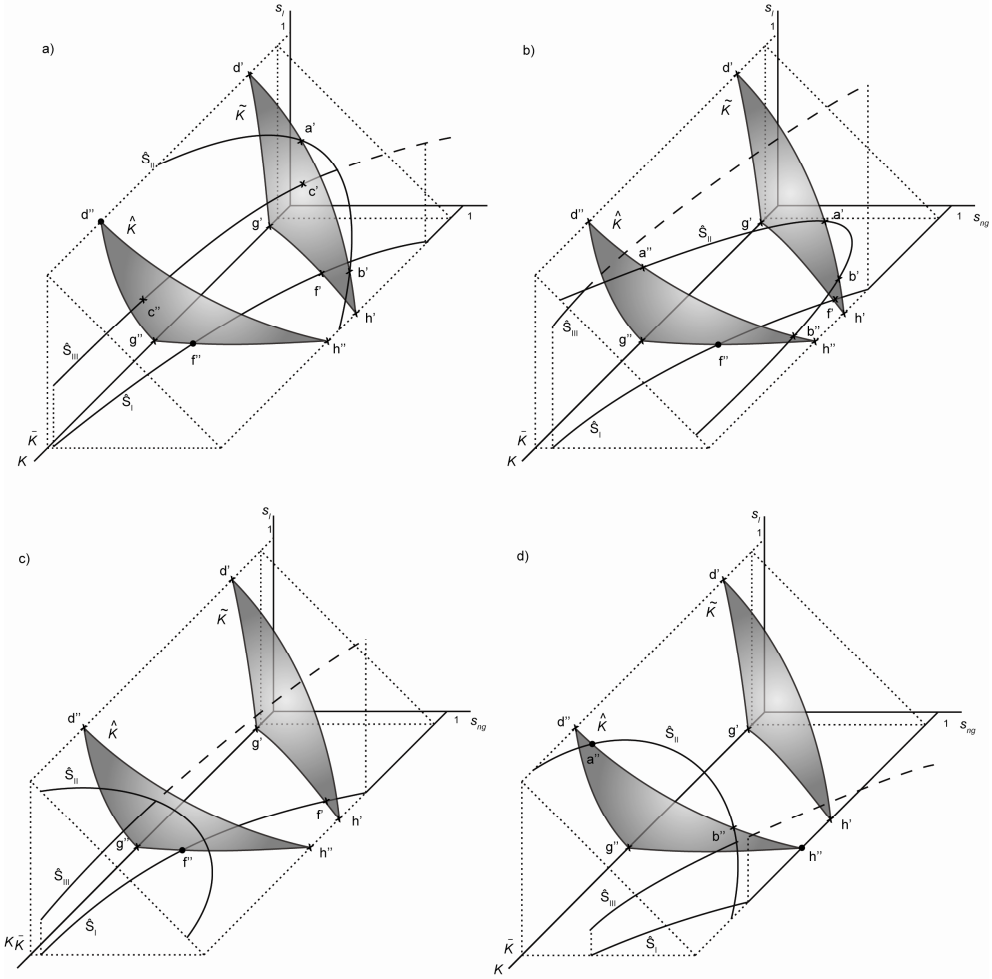

Fig. 5.13. Other equilibrium configurations of the combined system in the ecolabel and unilateral commitment model.

Moving to heterogeneous equilibria of the combined system, proposition 5.5 presents the existence conditions, and propositions 5.5 and 5.6 present, respectively, the stability conditions for heterogeneous equilibria where two and three strategies coexist.

Proposition 5.5: *Whenever there exists a set of values of (s_{ng} , s_l , K) belonging to the feasible region such that one of the isoclines of the population shares at least one point with any of the isoclines of the natural capital, a mixed equilibrium of the combined system exists.*

Given that there are two isoclines of the natural resource, this causes the total number of possible heterogeneous equilibria to double with respect to those in the model with exogenous capital. However, stability conditions restrict the number of stable equilibria of the system.

Proposition 5.6: *A population composed of green and non-green firms is locally asymptotically stable if F'(K)<0, and* $\frac{\partial \delta(s_{ng},K)}{\partial s_{ng}} + \frac{N \cdot a_g}{F'(K)} \frac{\partial \delta(s_{ng},K)}{\partial K} > 0$. *A population composed of ecolabel and green firms is always unstable. A population composed of ecolabel and non-green firms it is locally asymptotically stable if F'(K)<0,* $\delta(s_{ng},K) < c(a_g)$, $\frac{\partial R(s_l,K)}{\partial s_l} < \frac{\partial \delta(s_{ng},K)}{\partial s_{ng}}$, *and* $\left(\frac{\partial \delta(s_{ng},K)}{\partial s_{ng}} - \frac{\partial R(s_l,K)}{\partial s_l} \right) + \frac{N \cdot a_l}{F'(K)} \left(\frac{\partial \delta(s_{ng},K)}{\partial K} + \frac{\partial R(s_l,K)}{\partial K} \right) > 0$.

Proposition 5.6 determines that only those equilibria that belong to $\hat{K}(\cdot)$ can be stable. In addition, it states that, for those equilibria to be stable, a change in the composition of the population must be detrimental for the payoff of the strategy that increases adherence as compared with the other existing strategy in the equilibrium, that is, $\partial(\pi_g - \pi_{ng})/\partial s_{ng} > 0$ in the green and non-green equilibrium and $\partial(\pi_l - \pi_{ng})/\partial s_{ng} > 0$ in the ecolabel and non-green equilibrium.

Points *f''* in figures 5.13.a-c represent stable green and non-green equilibria. In figures 5.13.b and c, this is the only stable equilibrium. In the first case, equilibria containing a positive proportion of ecolabel firms exist, but they are not stable. Specifically, *a''* cannot be stable as in *a''* payoffs of both non-green and ecolabel strategies are lower than those of the green strategy, that is, $\delta(s_{ng},K)>c(a_g)$ and $R(s_l,K)<c(a_l)-c(a_g)$. In figure 5.13.c, no equilibrium exists in which a proportion of firms are members of the ecolabel, since the minimum level of natural capital that is required for being worth becoming a member of the ecolabel is higher than the level of natural capital that the resource can steadily provide.

In figure 5.12 there exists a stable equilibrium with positive ecolabel membership. This figure presents four equilibria where ecolabel and non-green firms coexist for s_g=0. Among those, only *a''*, for which *K* is the highest, represents a stable equilibrium.

It can be shown that $K_{a''} > K_{f''}$. Therefore, when successful, the ecolabel can trigger an improvement in environmental quality, and this happens even if there is only partial participation. This result is consistent with previous literature defending that even though an industry-wide voluntary approach is not likely to induce full participation, it can still be a viable means of achieving relevant environmental objectives in aggregate terms for that industry (Alberini et al., 2002).

Proposition 5.7: *An equilibrium of the combined system where all strategies coexist is always conditionally stable.*

In figures 5.12 and 5.13, the isocline $\hat{S}_{III}$ represents situations where payoffs of the three strategies are equal. Its intersection with the isoclines of natural capital determines equilibria *c'* and *c''*. Associated with each one, there may be a stable arm (if there are two positive and one negative eigenvalues) or a set of convergent paths that lie on a two-dimensional manifold (if there are one positive and two negative eigenvalues). The conditional stability characteristics of *c'* and *c''* imply that the system can follow paths that converge to long run situations where the three strategies coexist. It is also interesting to note that one of these situations is characterized by a low level of natural capital, $\tilde{K}(\cdot)$. Nevertheless, these equilibria are not locally asymptotically stable, since any marginal deviation from either *c'* or *c''* out of the stable arm or the stable two-dimensional manifold places the system in a divergent path.

Sensitivity and bifurcation analysis of the combined system

When considering the combined system, the possible scenarios in terms of number and stability of equilibria increase with respect to those of the population dynamics. Thus, the values of critical parameters that imply dramatic changes in the equilibrium configuration are larger. In this section, we do not develop a comprehensive sensitivity analysis, but rather present an extension of the sensitivity analysis developed for the population dynamics (we also assume in this section that the relation between $\hat{S}_{II}$ and $\hat{S}_{III}$ is such that *a''* and *d''* are stable unless otherwise stated). First, we focus our attention on bifurcations resulting from changes in a_l and a_g which affect the stability of equilibria where a positive proportion of firms join the ecolabel in the long run. Second, we consider changes in the size of the population of users of the natural CPR. Note that now several parameters of the system affect simultaneously the isoclines of the population and the isoclines of the natural resource, making the sensitivity analysis more complex. All proofs and demonstrations are presented in appendix 5.III.

Let us start by considering the consequences of variations in abatement levels required to join the ecolabel, a_l. Again, there is a value of a_l generating a bifurcation point that determines the stability of the homogeneous all-ecolabel population equilibrium (solid line in figure 5.14). Figure 5.14 represents the sloping plane of the prism defining the feasible region.

Proposition 5.8: *If* $c(a_l) = R(1, \hat{K})$, *d'' is a non-hyperbolic equilibrium.*

For lower values of a_l, *d''* is a stable equilibrium of the system, whereas for higher values of a_l, *d''* becomes unstable and a new stable equilibrium *a''* appears.

Since this bifurcation affects a corner-solution equilibrium, the conditions determining the existence of a transcritical bifurcation in equilibrium *d''* are the same as in the model with exogenous capital, restricting it to the equilibrium in $\hat{K}$.

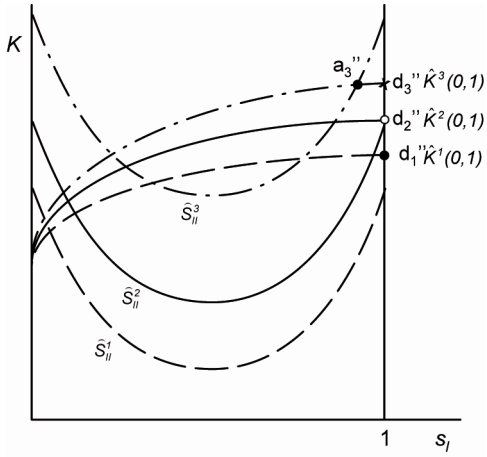

Fig. 5.14. Sensitivity analysis of the combined system to a_l. Bifurcation in equilibrium *d''*.

Further, as was also occurring in the model with exogenous capital, there exists a value of a_l that determines that the ecolabel can be viable in the long run.

Proposition 5.9: *Equilibrium a'' is non-hyperbolic if* $\left(\frac{\partial\delta(s_{ng},K)}{\partial s_{ng}}-\frac{\partial R(s_l,K)}{\partial s_l}\right)+\frac{N\cdot a_l}{F'(K)}\left(\frac{\partial\delta(s_{ng},K)}{\partial K}+\frac{\partial R(s_l,K)}{\partial K}\right)=0$ *evaluated in that point.*

If there is a value $a_l \in (0,1)$ such that *a''* exists, then given the assumption $\lim_{a_l\to 1} c(a_l)=\infty$, there is also a value $a_l \in (0,1)$ such that $\hat{S}_{II}$ is tangential to $\hat{K}$[27]. At the tangency point, proposition 5.9 holds; that is, the marginal effect on the difference of payoffs of changes in the composition of the population between being ecolabel and non-green is zero. This occurs when equilibria *a''* and *b''* converge at the tangential point, becoming a unique, non-hyperbolic equilibrium. For larger values of a_l, there are no equilibria with a positive proportion of ecolabel firms. This constitutes a saddle-node or fold bifurcation (Gandolfo, 1996,pp.472-473).

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[27] If a' exists for a value $a_l \in (0,1)$, then it is also true that there is a value $a_l \in (0,1)$ such that $\hat{S}_{II}$ is tangential to $\tilde{K}$.

Notice that proposition 5.9 implies that, at the bifurcation, $\partial R/\partial s_l < \partial \delta/\partial s_{ng}$; that is, the sensitivity of reputation premiums to changes in the population composition is lower than that of premiums from green differentiation.

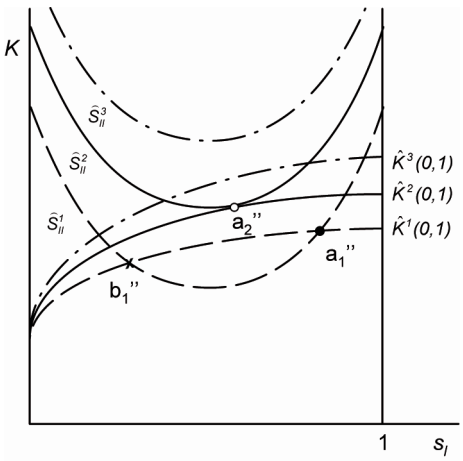

Fig. 5.15. Sensitivity analysis of the combined system to a_l. Bifurcation in equilibrium *a''*.

These two bifurcation analyses underline the importance of ecolabels' abatement and other costly requirements for the success of these initiatives. Thus, it has been widely reported that a difficulty for the operation of an ecolabel is that too-stringent criteria are set (Buckley, 2002; Mihalic, 2000; WTO, 2002) and that the administrative fees required to enter the program might deter adherence (Sasidharan et al., 2002; WTO, 2002). Among others, one criticism of tourism ecolabels is that they are expensive in terms of both money and time (Font, 2002). In developing countries, it has been defended that ecolabelling programs would be pressured into lowering their criteria to increase industry participation (Sasidharan et al., 2002). Additionally, it is proposed that costs of membership in an ecolabel should be restricted to cover only part of the administrative costs (WTO, 2002).

Note that the location of the bifurcation differentiating between situations where the ecolabel can or can not survive in the long run depends not only on the costs associated with ecolabel membership, but also on factors affecting the reputation function. Then, the comments in section 5.2 regarding the crucial importance of marketing campaigns related to the ecolabel and on building credibility for the information released become relevant here. In addition to these, a recent phenomenon to be considered is the over-launch of green certification programs in tourism, which is alleged to confuse costumers. There is a concern that the presence of a wide array of ecolabels and the different information released by such schemes would prevent visitors from making objective judgments regarding the legitimacy of firms' environmental responsibility claims, lowering the value of all initiatives (Ayuso, 2007; Lübbert, 2001; Mihalic, 2000; Sasidharan et al., 2002).

Further, false or misleading labeling could lead to an adverse selection situation where consumers could not detect the environmental attributes of the product before purchase though that information would be available to sellers (Ibanez et al., 2008). According to Ibanez and Grolleau (2008), under this condition, if labeling costs for polluting firms are very low, low-polluting firms will not be able to distinguish themselves and will be driven out of the market. Only if labeling is much more costly for polluting than for low-polluting firms will these two groups voluntarily choose different environmental strategies, with environmentally friendly firms labeling their products.

As in the section with exogenous capital, we can also analyze the implications of a_g in the configuration of equilibria. The initial situation in figure 5.16 is qualitatively identical to figure 5.13.b. Given that a_g is relatively low, equilibria a_1'' and b_1'' are unstable, and $\hat{S}_{III}$ is out of the feasible region for values of K belonging to $\hat{K}(\cdot)$. Increases in a_g do not affect $\hat{S}_{II}$, but $\hat{S}_{III}$ and $\hat{K}(\cdot)$ are modified. Strengthening abatement requirements in order to undertake unilateral commitments shifts $\hat{K}(\cdot)$ upwards. Changes of $\hat{S}_{III}$ are more complex. Increasing a_g entails a right-down movement in figure 5.13.b, which is represented by a left-shift in figure 5.16. Accordingly, $\hat{S}_{III}$ will eventually cross $\hat{S}_{II}$ in equilibrium a_2'', turning it a non-hyperbolic equilibrium. Further increases in a_g make a_3'' stable, and $\hat{S}_{III}$ crosses $\hat{K}(\cdot)$, generating a new non-stable equilibrium, c''.

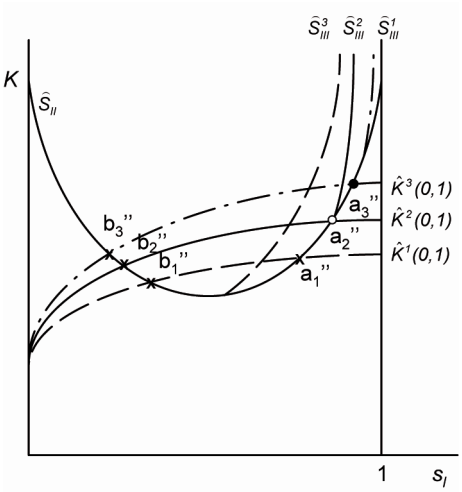

Fig. 5.16. Sensitivity analysis of the combined system to a_g.

Proposition 5.10: *Equilibrium a'' is non-hyperbolic if* $\delta(s_{ng}, \hat{K}) = c(a_g)$ *evaluated at that point.*

In other words, proposition 5.10 states that when *c''* and *a''* collapse, they become a unique, non-hyperbolic equilibrium and a transcritical bifurcation occurs. Given that equilibrium *a''* belongs to $\widetilde{S}_{II}$, when $\delta(s_{ng}, \hat{K}) = c(a_g)$, then $R(s_l, \hat{K}) = c(a_l) - c(a_g)$. Recall that according to lemma 5.5 and proposition 5.4, these are the conditions determining existence of *c''*. Then, abatement costs to undertake unilateral commitments are strictly compensated by premiums to green differentiation, while at the same time extra abatement costs to become a member of an ecolabel (when being green) are strictly compensated by the reputation premium. Higher levels of a_g make $\delta(s_{ng}, \hat{K}) < c(a_g)$, and thus, according to proposition 5.6, *a''* becomes stable.

The abatement level implemented by green firms is not, in principle, a policy parameter, as it is (exogenously) chosen by individual firms. However, a_g should increase with the stringency of environmental regulation since, in our model, green behavior is justified by the aim of differentiation with respect to firms that just meet legal mandates. Under this interpretation, the previous bifurcation analysis implies that success of ecolabels may be favored by more stringent regulation. This seems to support a crowding-in effect of environmental regulation on voluntary environmental certification. This is consistent with claims by the manufacturing literature that voluntary activity is a complement to regulation (Lyon et al., 2002). Empirical estimates show that public policy can create the regulatory and market-based pressures that induce adoption of environmental management systems by means of stringent mandatory regulation and the provision of environmental information about firms to the public (Anton et al., 2004). This evidence is consistent with analytical findings that support the idea that firms are more likely to join a voluntary program the stricter the program's regulatory background (Segerson et al., 1998; Vidreras et al., 2000). The limited research to date for tourism in this area conforms to these findings. Empirical examinations in Costa Rica support the notion that, in addition to market incentives, adequate institutional pressures may also be necessary conditions for adherence to environmental management systems by hotels in order to promote compliance beyond regulated environmental behavior (Rivera, 2004). The idea that tourism ecolabels should be integrated with public policy mechanisms such as environmental regulations and standards to be most effective has been defended (Buckley, 2002).

Another parameter of the game that has profound implications in the configuration of equilibria is the size of the population of firms that make use of the CPR. Increases in *n* shift the isoclines of the natural resource as shown in figure 5.17.

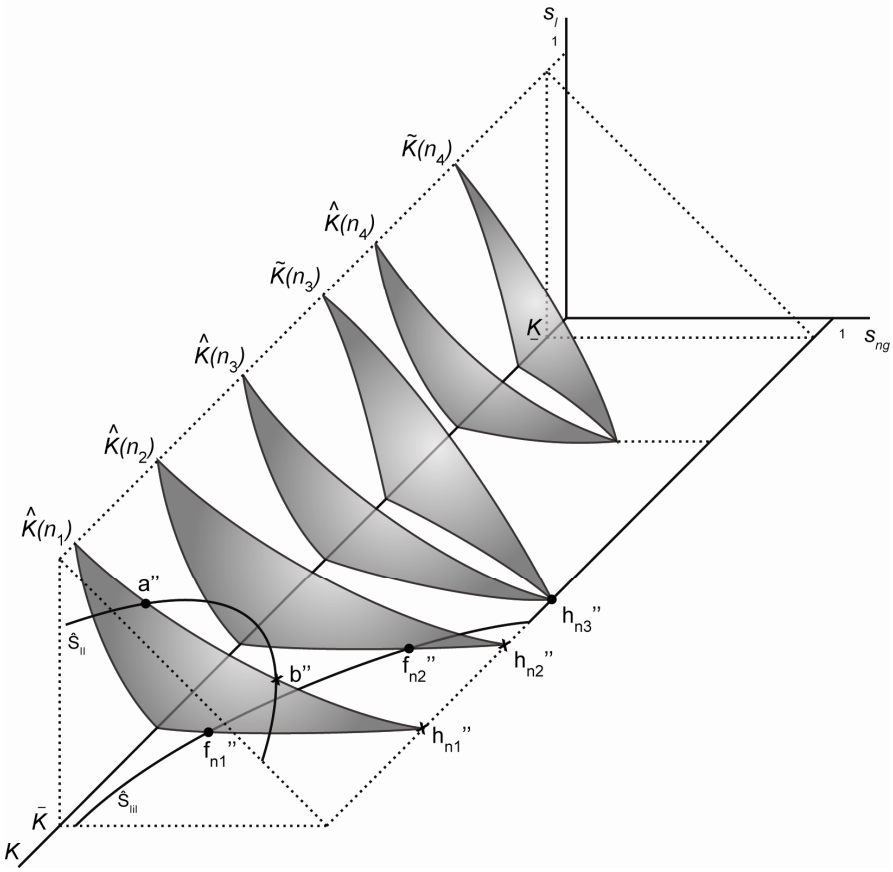

Fig. 5.17. Sensitivity of the combined system to *n*.

The result is that the degree of implementation of voluntary initiatives is affected by the size of the population. It is possible that starting from an initial situation where the long-term population configuration can contain a positive proportion of ecolabel firms ($a^{"}_{n_1}$), increases in the population erode the economic incentives to be a member of the ecolabel. Then, unilateral commitments are the only voluntary initiative that might be undertaken by this higher population of tourism firms ($f^{"}_{n_2}$). If the population of firms increases further, it can be the case that even the incentives to be green are undermined and no firm in the population develops voluntary environmental initiatives ($h^{"}_{n_3}$). Given an all-non-green population composition, it is obvious that further increases in the population will eventually lead to the exhaustion of the resource (as is the case for n_4 in figure 5.17).

However, depending on the fragility of the natural resource, it is possible that exhaustion may appear even with a positive proportion of firms engaging in vol-

untary initiatives. Figure 5.18 presents a situation where extinction of the resource is possible for values of $s_g>0$.

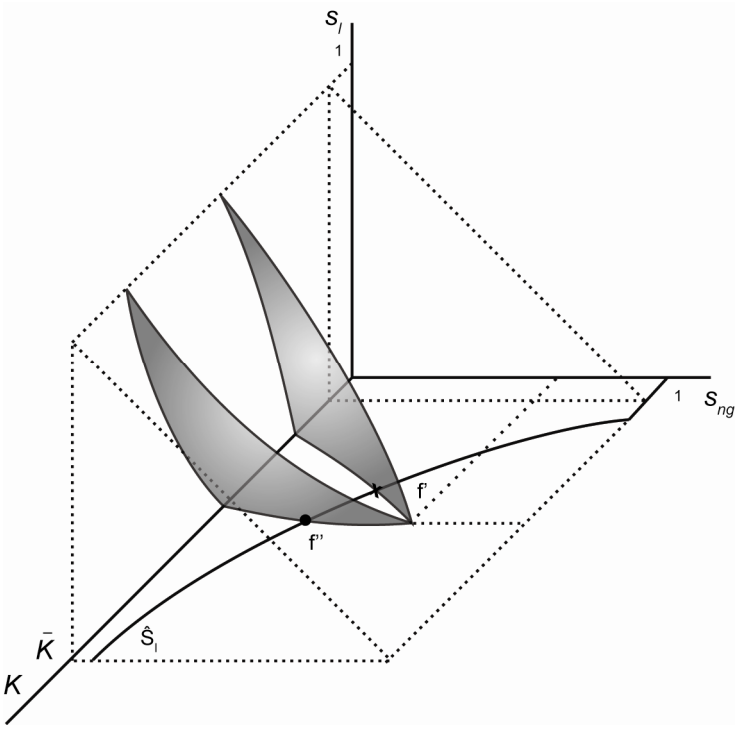

Fig. 5.18. Extinction of the CPR for $s_g>0$.

Therefore, the existence of economic incentives to undertake voluntary environmental initiatives can not preclude tragic results when we allow increases in the number of CPR users. Consequently, it is necessary to limit the number of tourism firms that can make use of a natural CPR, even though these engage in voluntary initiatives that reduce their individual impacts. If there is no restriction on the number of firms that can use a particular CPR, this can entail initially eco-labelled or green firms giving up their abatement strategies and abandoning the green niche. This could eventually lead to pressures on the resource above its regeneration capacity and thus, the CPR would collapse.

5.5. Conclusion

This chapter analyzes changes in the economic incentives of tourism firms to undertake voluntary environmental initiatives after an ecolabel is exogenously created in a setting in which there was scope for the existence of unilateral commitments. We develop an evolutionary game-theoretical model of a population of tourism firms making use of a natural CPR, the environmental quality of which is endogenously considered.

First, we consider a situation in which available strategies to tourism firms are compliance with environmental regulations or the undertaking of voluntary unilateral commitments to improve their environmental behavior beyond that legally mandated. Second, we extend the unilateral commitment model by introducing an ecolabel. This is a non-coercive institutional change based on voluntary adherence by tourism firms. We do not explicitly model the creation of the ecolabel, but analyze the dynamic behavior of the system once the ecolabel is exogenously introduced. According to some empirical evidence, we assume that abatement efforts required to become a member of the ecolabel are higher than those to undertake unilateral commitments. Thus, this strategy entails higher costs of joining.

Therefore, we model two different types of voluntary initiatives and the strategy of no voluntary abatement. The literature on voluntary action has compared one type of voluntary initiative (that being either unilateral commitments, negotiated agreements or ecolabels) with the no voluntary abatement option, but to the best of our knowledge, no study has simultaneously analyzed different voluntary initiatives vs. the no-action situation. Thus, we extend the literature in this direction.

We show that individual voluntary initiatives in the form of unilateral commitments can emerge even without the existence of informal rewards or punishment, as opposed to previous results in the related literature (Osés et al., 2007; Sethi et al., 1996). In our model, incentives to follow environmentally-friendly strategies depend on profit-seeking motivations raised by demand effects. As in Osés and Viladrich, and contradictory to Sethi and Somanathan (1996), heterogeneous populations composed of green and non-green firms can exist in the long run. For this to occur, it is necessary that for a positive proportion of green firms, premiums from green differentiation equal abatement costs of unilateral commitments. The proportion of green firms in the long run further depends on the steady-state level of natural capital: the higher the natural capital, the larger the green niche the industry can develop. Thus, like Osés and Viladrich (2007) our model reproduces real-world situations, where heterogeneity of agents is obvious to empirical researchers (Marshall, 2005; Ostrom, 2000; Ostrom, Burger, Field, Norgaard, & Policansky, 1999) and contributes to the theoretical work to explain these realities.

Once the institutional setting is expanded to include an ecolabel, the population can evolve towards a second heterogeneous composition with ecolabel and non-green firms. When the ecolabel prospers, green firms tend to disappear. Beyond a

certain population composition, it is more profitable for green firms to develop further abatement and become members of the ecolabel. Equilibria with the three strategies can exist but cannot be stable. It is noteworthy that when an ecolabel prospers, the proportion of non-green firms is lower and the steady-state natural capital of the CPR is higher than that resulting from populations with firms undertaking unilateral commitments.

Several factors affect the long-term subsistence of the ecolabel, namely the institutional setting, the initial proportion of promoters of the ecolabel, the type of firms that act as promoters, the extent to which unilateral commitments are undertaken, and the environmental quality of the CPR.

The institutional setting of environmental regulation and voluntary environmental initiatives strongly influences the capacity of an ecolabel to exist in the long run. These factors jointly determine the abatement costs of voluntary initiatives, which is one of the crucial factors that determine the existence and stability of populations with ecolabel firms. In addition, for an ecolabel to exist in the long run, it is necessary that a minimum contributing set of firms join initially so that a critical reputation premium is created. The initial reputation premium has to at least compensate for the extra abatement cots of becoming a member of the ecolabel for green firms. This result shows a fundamental difference between the two voluntary initiatives since unilateral commitments can be initiated by a single firm, whereas some coordinated action among tourism stakeholders is required to organize an initial group of promoters. In addition, the type of firms that act as promoters is also relevant. When only green firms act as promoters of the ecolabel, the proportion of initial promoters required for the long-term survival of the ecolabel is lower than when non-green firms also initially join. Adherence by non-green firms reduces premiums from green differentiation, making the two environmentally-friendly strategies less attractive. Further, the long-term survival of the ecolabel depends on the extent to which unilateral commitments are undertaken by the population of firms. If the ecolabel is introduced too early along the path of implementation of unilateral commitments, the ecolabel can erode the environmentally-friendly path by inducing green firms to join an ecolabel that cannot gather enough members to subsist in the long run. Finally, as for unilateral commitments, it is required that a minimum level of natural capital be obtained for the ecolabel to prosper. Once this has occurred, there is a feed-back effect between growth in the proportion of ecolabel firms and natural capital. The higher the proportion of ecolabels, the higher the level of natural capital, and this in turn enhances the incentives to become a member of the ecolabel.

Further, we also provide an explanation for situations in which voluntary initiatives are generally adopted or do not emerge at all. When demand effects are too low, environmental quality of the CPR is not high enough, impediments exist to coordination, or firms do not consider voluntary initiatives as a relevant strategy to consider, homogeneous populations where no firm undertakes voluntary abatements will result. This conforms to findings from empirical examinations by Ostrom (1990) on design principles missing in systems failing to self-govern (table

2.2). Further, we show that it is also possible that an ecolabel can raise its numbers of adherents until all firms adhere to the certification. This would be consistent with evidence in the manufacturing literature where standards of ecolabels lose their connotations of a label and are perceived as a requirement by consumers (Buckley, 2002). Contrary to ecolabels, which increase their attractiveness as more firms join, we show that individual voluntary initiatives based on differentiation for green niches can not extend to the whole population. When all firms are green, there is no differentiation, and thus firms will prefer to avoid abatement costs.

There are several natural extensions that can be developed from the model presented in this chapter. First, we could endogenously model demand for green attributes of firms and the CPR by tourism markets, following the literature in this respect on industrial economics. A second alternative to include demand markets would be to consider the role of tour operators as intermediaries that might have green preferences (Calveras et al., 2005 being an example). Second, we could explicitly model the role of regulation by governmental agencies in the model. As already mentioned, the baseline level of mandated abatement influences abatement costs to improve environmental behavior beyond regulation, which affects the existence and stability of heterogeneous populations of firms. Third, in addition to the diffusion mechanism of strategies (which we have modeled by means of replicator dynamics), we could introduce a network of social interaction to the system. This could determine that interactions do not occur globally in the population, but that there are criteria of preferable interaction (e.g., with close neighbors). Finally, we could analyze the effect on price premiums of competition between destinations for an international green niche of tourists. Consequently, differentiation premiums might not totally disappear when all firms using a particular CPR are green. Firms would then cooperate to attract tourists to the destination and later compete at the destination level, as noted in the concept of competition in the tourism literature (Edgell & Haenisch, 1995).

5.6. References

Alberini, A., & Segerson, K. (2002). Assessing voluntary programs to improve environmental quality. *Environment & Resource Economics*, 22, 157-184.

Alegre, J., & Cladera, M. (2006). Repeat visitation in mature sun and sand holiday destinations. *Journal of Travel Research*, 44, 288-297.

Alegre, J., & Juaneda, C. (2006). Destination loyalty: Consumers' economic behavior. *Annals of Tourism Research*, 33, 648-706.

Álvarez, M., Burgos, J., & Céspedes, J. (2001). An analysis of environmental management, organizational context and performance of Spanish hotels. *Omega*, 29, 457-471.

Amacher, G., Koskela, E., & Ollikainen, M. (2004). Environmental quality competition and ecolabeling. *Journal of Environmental Economics and Management*, 47, 284-306.

Anton, W., Deltas, G., & Khanna, M. (2004). Incentives for environmental self-regulation and implications for environmental performance. *Journal of Environmental Economics and Management*, 48, 632-654.

Arimura, T., Hibiki, A., & Katayama, H. (2008). Is a voluntary approach an effective environmental policy instrument? A case for environmental management systems. *Journal of Environmental Economics and Management*, 55, 281-295.

Arora, S., & Gangopadhyay, S. (1995). Toward a theoretical model of voluntary overcompliance. *Journal of Economic Behavior & Organization*, 28, 289-309.

Ayuso, S. (2006). Adoption of voluntary environmental tools for sustainable tourism: Analysing the experience of Spanish hotels. *Corporate Social Responsibility and Environmental Management*, 13, 207-220.

Ayuso, S. (2007). Comparing voluntary policy instruments for sustainable tourism: The experience of the Spanish hotel sector. *Journal of Sustainable Tourism*, 15, 144-159.

Blanco, E., Rey-Maquieira, J., & Lozano, J. (2009). Economic Incentives for Tourism Firms to Undertake Voluntary Environmental Management. *Tourism Management*, 30, 112-122.

Brau, R., & Carraro, C. (2004). *The economic analysis of voluntary approaches to environmental protection. A survey*, Working papers: Centro Ricerche economiche nord sud. Università di Cagliari, Università di Sassari.

Buckley, R. (1992). New United States Federal Trade Commission Guidelines for Ecolabelling and Green Advertising. *Environmental and Planning Law Journal*, 9, 479.

Buckley, R. (2002). Tourism ecolabels. *Annals of Tourism Research*, 29, 183-208.

Calveras, A. (2003). Incentives of international and local hotel chains to invest in environmental quality. *Tourism Economics*, 9, 297-306.

Calveras, A. (2007). Expansion of a hotel chain and environmental quality. *Investigaciones económicas*, XXXI, 263-295.

Calveras, A., & Vera-Hernández, M. (2005). Quality externalities among hotel establishments: what is the impact of tour operators? *Tourism Economics*, 11, 571-593.

Candela, G., & Cellini, R. (2006). Investment in tourism market: a dynamic model of differentiated oligopoly. *Environmental and Resource Economics*, 35, 41-58.

Carmona-Moreno, E., Céspedes-Lorente, J., & de Burgos-Jimenez, J. (2004). Environmental strategies in Spanish Hotels: Contextual factors and performance. *The Service Industries Journal*, 24, 101-130.

Claver-Cortés, E., Molina-Azoín, J. F., Pereira-Moliner, J., & López-Gamero, M. D. (2007). Environmental strategies and their impact on hotel performance. *Journal of Sustainable Tourism*, 15, 663-679.

Conrad, K. (2005). Price competition and product differentiation when consumers care for the environment. *Environment & Resource Economics*, 31, 1-19.

Davis, J. J. (1991). A blueprint for green marketing. *Journal of Business Strategy*, 12 (4), 14-17.

Dawson, N. L., & Segerson, K. (2008). Voluntary agreements with industries: Participation incentives with industry-wide targets. *Land Economics*, 84, 97-114.

Delmas, M., & Keller, A. (2005). Free riding in voluntary environmental programs: The case of the U.S. EPA WasteWise program. *Policy Sciences*, 38, 91-106.

Dodds, R., & Joppe, M. (2005). *CSR in the tourism industry? The status of and potential for certification, codes of conduct and guidelines*. I. C. Department, International Finance Corporation, World Bank Group.

Edgell, D. L., & Haenisch, R. (1995). *Coopetition: Global Tourism Beyond The Millennium*. Kansas City: International Policy Publishing.

Font, X. (2002). Environmental certification in tourism and hospitality: progress, process and prospects. *Tourism Management*, 23, 197-205.

Foster, T. S. J., Sampson, S. E., & Dunn, S. C. (2000). The impact of customer contact on environmental initiatives for service firms. *International Journal of Operations & Production Management*, 20, 197-203.

Friedman, D. (1991). Evolutionary games in economics. *Econometrica*, 59, 637-666.

Friedman, D. (1998). On economic applications of evolutionary game theory. *Journal of Evolutionary Economics*, 8, 15-43.

Gandolfo, G. (1996). *Economic dynamics* (3rd ed.). Berlin: Springer-Verlag.

Glachant, M. (2007). Non-binding voluntary agreements. *Journal of Environmental Economics and Management*, 54, 32-48.

González, M., León, C., & Padrón, N. (2006). Obsolescencia y políticas de renovación medioambiental en el sector turístico. *Cuadernos Económicos del ICE*, 71, 153-176.

Grove, S. J., Fisk, R. P., Pickett, G. M., & Kangun, N. (1996). Going green in the service sector: Social responsibility issues, implications and implementation. *European Journal of Marketing*, 30 (5), 56-66.

Halme, M. (2001). Learning for sustainable development in tourism networks. *Business Strategy and the Environment*, 10, 100-114.

Healy, R. (1994). The "common pool" problem in tourism landscapes. *Annals of Tourism Research*, 21, 596-611.

Hofbauer, J., & Sigmund, K. (2003). Evolutionary game dynamics. *Bulletin of the American Mathematical Society*, 40, 479-519.

Huybers, T., & Bennett, F. (2002). *Environmental management and the competitiveness of nature-based tourism destinations*. Cheltenham: Edward Elgar Publishing.

Huybers, T., & Bennett, F. (2003). Environmental management and the competitiveness of nature-based tourism destinations. *Environmental and Resource Economics*, 24, 213-233.

Ibanez, L., & Grolleau, G. (2008). Can ecolabelling schemes preserve the environment? *Environment & Resource Economics*, 40, 233-249.

Imperial, M. (1999). Institutional analysis and ecosystem-based management: The institutional analysis and development framework. *Environmental Management*, 24, 449-465.

Kassinis, G. I., & Soteriou, A. C. (2003). Greening the service profit chain: The impact of environmental management practices. *Production and Operations Management*, 12, 386-402.

Khanna, M. (2001). Non-mandatory approaches to environmental protection. *Journal of Economic Surveys*, 15, 291-324.

Knowles, T., & Curtis, S. (1999). The market viability of European mass tourist destinations. A post-stagnation life-cycle analysis. *International Journal of Tourism Research*, 1, 87-96.

Lorenz, H.-W. (1989). Bifurcation theory in dynamical economics. In M. Beckmann, & W. Krelle (Eds.), *Lecture notes in economics and mathematical systems* (pp. 64-99). Berlin: Springer-Verlag.

Lübbert, C. (2001). Tourism ecolabels market research in Germany. In X. Font, & R. Buckley (Eds.), *Tourism ecolabelling: certification and promotion of sustainable management* (pp. 71-86). Wallingford: CAB International.

Lyon, T., & Maxwell, J. (2002). "Voluntary" approaches to environmental regulation. In M. Franzini, & A. Nicita (Eds.), *Economics Institutions and Environmental Policy* (pp. 75-120). Brookfield, Vermont: Ashgate Publishing.

Lyon, T., & Maxwell, J. (2008). Corporate social responsibility and the environment: A theoretical perspective. *Review of Environmental Economics and Policy*, 2, 240-260.

Mailath, G. (1998). Do people play Nash equilibrium? Lessons from evolutionary game theory. *Journal of Economic Literature*, XXXVI (September), 1347-1374.

Manzini, P., & Mariotti, M. (2003). A bargaining model of voluntary environmental agreements. *Journal of Public Economics*, 87, 2725-2736.

Marshall, G. R. (2005). *Economics for collaborative environmental management: Renegotiating the commons*. Sterling: Earthscan.

Mihalic, T. (2000). Environmental management of a tourist destination. A factor of tourism competitiveness. *Tourism Management*, 21, 65-78.

Moraga-González, J. L., & Padrón-Fumero, N. (2002). Environmental policy in a green market. *Environmental and Resource Economics*, 22, 419-447.

Morgan, M. (1991). Dressing up to survive: Marketing Majorca anew. *Tourism Management*, 12, 15-20.

Nowak, M. A., & Sigmund, K. (2004). Evolutionary dynamics of biological games. *Science*, 303, 793-799.

Osés, N., & Viladrich, M. (2007). On the sustainability of common property resources. *Journal of Environmental Economics and Management*, 53, 393-410.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action* (17th ed.). New York: Cambridge University Press.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives*, 14 (3), 137-158.

Ostrom, E., Burger, J., Field, C., Norgaard, R., & Policansky, D. (1999). Revisiting the commons: local lessons, global challenges. *Science*, 284, 278-282.

PATA. (2007). *Asia Travel Intentions Survey. April 2007*. Pacific Asian Travel Association.

Pergams, O., & Zaradic, P. (2008). Evidence for a fundamental and pervasive shift away from nature-based recreation. *PNAS*, 105, 2295-2300.

Pintassilgo, P., & Albino, J. (2007). "Tragedy of the commons" in the tourism accommodation industry. *Tourism Economics*, 13, 209-224.

Portney, P. R. (2008). The (not so) new corporate social responsibility: An empirical perspective. *Review of Environmental Economics and Policy*, 2, 261-275.

Rivera, J. (2002). Assessing a voluntary environmental initiative in the developing world: The Costa Rican Certification for Sustainable Tourism. *Policy Sciences*, 35, 333-360.

Rivera, J. (2004). Institutional pressures and voluntary environmental behavior in developing countries: Evidence from the Costa Rican hotel industry. *Society and Natural Resources*, 17, 779-797.

Sasidharan, V., Sirakaya, E., & Kerstetter, D. (2002). Developing countries and tourism ecolabels. *Tourism Management*, 23, 161-174.

Sedjo, R., & Swallow, S. (2002). Voluntary eco-labeling and the price premium. *Land Economics*, 78, 272-284.

Segerson, K., & Miceli, T. J. (1998). Voluntary environmental agreements: Good or bad news for environmental protection? *Journal of Environmental Economics and Management*, 36, 109-130.

Sethi, R., & Somanathan, E. (1996). The evolution of social norms in common property resource use. *American Economic Review*, 86, 766-788.

Sirakaya, E. (1997). Attitudinal compliance with ecotourism guidelines. *Annals of Tourism Research*, 24, 919-950.

Sirakaya, E., & Uysal, M. (1997). Can sanctions and rewards explain conformance behavior of tour operators with ecotourism guidelines? *Journal of Sustainable Tourism*, 5, 322-332.

Stoeckl, N. (2004). The private costs and benefits of environmental self-regulation: which firms have most to gain? *Business Strategy and the Environment*, 13, 135-155.

Tarui, N., Mason, C., Polansky, S., & Ellis, G. (2008). Cooperation in the commons with unobservable actions. *Journal of Environmental Economics and Management*, 55, 37-51.

Tisdell, C. (2001). National gains from international tourism in the light of environmental factors: Further considerations. In C. Tisdell (Ed.), *Tourism economics, the environment and development: Analysis and policy* (pp. 55-67): Edward Elgar.

UNEP (1998). *Ecolabels in the tourism industry*. Paris: United Nations Environment Programme.

Vidovic, M., & Khanna, N. (2007). Can voluntary pollution prevention programs fulfill their promises? Further evidence from EPA's 33/50 Program. *Journal of Environmental Economics and Management*, 53, 180-195.

Vidreras, J., & Alberini, A. (2000). The appeal of voluntary environmental programs: which firms participate and why? *Contemporary Economic Policy*, 18, 449-461.

WTO (1999). *Sustainable development of Tourism: An annotated bibliography*. Madrid: World Tourism Organization.

WTO (2002). *Voluntary initiatives for sustainable tourism: Worldwide inventory and comparative analysis of 104 eco-labels, awards and self-commitments*. Madrid, Spain: WTO.

WTO. (2008). *UNWTO World tourism barometer, June 2008*. WTO.

Appendix 5.I: Unilateral commitment model

A steady state of a two-dimensional system is locally asymptotically stable when the determinant of the Jacobian evaluated at that point has a positive value while the trace is negative. It is locally asymptotically unstable when both the determinant and the trace are positive, whereas it is a saddle-point when the determinant is negative.
This model is comprised of equations 5.4 and 5.5. Linearization of these equations results in a system whose Jacobian is:

$$J = \begin{pmatrix} J_{11} & J_{12} \\ J_{21} & J_{22} \end{pmatrix}$$

where
$$J_{11} = F'(K)$$
$$J_{12} = -N \cdot a_g$$
$$J_{21} = -s_{ng}(1 - s_{ng})\sigma$$
$$J_{22} = -\alpha + 2s_{ng}\alpha - s_{ng}(1 - s_{ng})\lambda$$

where we have defined
$$\alpha = \delta(s_{ng}, K) - c(a_g)$$
$$\lambda = \frac{\partial \delta(\cdot)}{\partial s_{ng}}$$
$$\sigma = \frac{\partial \delta(\cdot)}{\partial K}$$

and K and s_{ng} take different values depending on the specific steady state we consider.

Proof of proposition 5.1

In a heterogeneous equilibrium, according to lemma 1, α=0 and consequently,

$$|J| = F'(K)\left[-s_{ng}(1 - s_{ng})\lambda\right] - N \cdot a_g s_{ng}(1 - s_{ng})\sigma$$
$$\text{trace} J = F'(K) - s_{ng}(1 - s_{ng})\lambda$$

For this equilibrium to be locally asymptotically stable it is necessary that $F'(K)<0$ and $\lambda + \frac{N \cdot a_g}{F'(K)}\sigma > 0$. $F'(K)<0$ is necessary for the determinant not

being negative, and given that *F'(K)<0*, condition $\lambda + \frac{N \cdot a_g}{F'(K)} \sigma > 0$ guarantees that it is positive. *F'(K)<0* also makes the trace negative.

Proof of proposition 5.2

In a homogeneous all-non-green equilibrium, s_{ng}=1. Thus,

$$|J| = F'(K)\alpha$$

$$\text{trace} J = F'(K)$$

For the trace to be negative it is necessary that *F'(K)<0*. Given that *F'(K)<0*, it is necessary that α<0 for the determinant to be positive.

Appendix 5.II: Ecolabel and unilateral commitment model with exogenous K

This is again a two-dimensional system and, therefore, the rules for stability are those stated in appendix 5.I. The equations of this model are those of expression 5.8. Linearization results in a system whose Jacobian is:

$$J = \begin{pmatrix} J_{11} & J_{12} \\ J_{21} & J_{22} \end{pmatrix}$$

where

$$J_{11} = -(1 - s_{ng})\alpha - s_l \beta + s_{ng}\alpha - s_{ng}(1 - s_{ng})\lambda$$

$$J_{12} = -s_{ng}\beta - s_{ng} s_l \varepsilon$$

$$J_{21} = s_l \alpha + s_l s_{ng} \lambda$$

$$J_{22} = (1 - s_l)\beta + s_{ng}\alpha - s_l \beta + s_l \beta + s_l (1 - s_l)\varepsilon$$

and where we have additionally defined

$$\beta = R(s_l, K) - [c(a_l) - c(a_g)]$$

$$\varepsilon = \frac{\partial R(\cdot)}{\partial s_l}$$

$$\Omega = \delta(s_{ng}, K) + R(s_l, K) - c(a_l)$$

where K is exogenous and s_{ng} and s_l take the different steady state values.

Proof of Lemma 5.3

The stability of homogeneous equilibria of the population can be proven by:

Homogeneous all-ecolabel equilibrium (s_l=1),

$$|J| = \beta\Omega$$

$$\text{trace}J = -(\beta + \Omega)$$

Then, for this equilibrium to be locally asymptotically stable, it is required that $R(1,K)>c(a_l)$, since consequently $\beta>0$ and $\Omega>0$, and thus the determinant is positive and the trace negative.

Homogeneous all-green equilibrium (s_{ng}=0; s_l=0),

$$|J| = -\alpha\beta$$

$$\text{trace}J = \beta - \alpha$$

For this equilibrium to be stable, it is required that $\alpha>0$ for s_{ng}=0, or equivalently, that $\delta(0,K)-c(a_g)=-c(a_g)>0$. This is an impossible condition to meet, given that we have assumed $c(a_g)\geq 0$.

Homogeneous all-non-green equilibrium (s_{ng}=1),

$$|J| = \alpha\Omega$$

$$\text{trace}J = \alpha + \Omega\,.$$

For this equilibrium to be stable, it is necessary that $\delta(1,K)<c(a_g)$, which makes $\alpha<0$ and $\Omega<0$.

Proof of Lemma 5.4

Here we analyze the stability of heterogeneous equilibria where only two strategies exist.

Heterogeneous equilibria of the population composed of non-green and green firms (s_{ng},0), for $s_{ng} \in (0,1)$,

$$|J| = -s_{ng}(1 - s_{ng})\lambda\beta$$

$$\text{trace}J = \beta - s_{ng}(1 - s_{ng})\lambda$$

$$\text{Discriminant}J = \left[\beta + s_{ng}\left(1 - s_{ng}\right)\lambda\right]^2$$

For this equilibrium to be stable, it is necessary that $\beta<0$, which is a condition that always holds given that we have assumed $c(a_g)<c(a_l)$. Moreover, the discriminant is positive, and thus convergence to this equilibrium is always monotonic.

Heterogeneous equilibria of the population composed of ecolabel and green firms $(0,s_l)$ for $s_l \in (0,1)$,

$$|J| = -s_l(1-s_l)\varepsilon\alpha$$

$$\text{trace}J = -\alpha + s_l(1-s_l)\varepsilon$$

There is no possible combination of parameter values that makes the determinant positive and the trace negative simultaneously in this equilibrium. Thus, it is always unstable.

Heterogeneous equilibria of the population composed of ecolabel and non-green firms (s_{ng},s_l), for $(s_{ng}+s_l)=1$,

$$|J| = s_l(1-s_l)\alpha(\varepsilon-\lambda)$$

$$\text{trace}J = \alpha + s_l(1-s_l)(\varepsilon-\lambda)$$

$$\text{Discriminant}J = [\alpha - s_l(1-s_l)(\varepsilon-\lambda)]^2$$

For this equilibrium to be stable, it is necessary that $\alpha<0$ and $\varepsilon<\lambda$. Since the discriminant is positive, convergence to this equilibrium is monotonic.

Proof of Lemma 5.5

Heterogeneous equilibria where the population is composed of ecolabel, green and non-green firms (s_{ng},s_l), for $(s_{ng}+s_l) \in (0,1)$,

$$|J| = -\lambda\varepsilon s_{ng}s_l(1-s_l-s_{ng})$$

This determinant is negative for any possible combination of the parameter values, and thus, this equilibrium is a saddle-point.

Appendix 5.III: Ecolabel and unilateral commitment model with endogenous K

The characteristic equation of the Jacobian of a three-dimensional system is:

$$x^3 - c_1x^2 + c_2x - c_3 = 0$$

where:

c_1=*TraceJ*

c_2=sum of all second-order principal minors of *J*

c_3=$|J|$

According to Descartes' theorem, the number of positive roots of the characteristic equation cannot exceed the number of changes in the sign of the coefficients, whereas the number of positive roots cannot be greater than the number of continuations in the signs of the coefficients (Gandolfo, 1996, p.54). This implies, on the one hand, that there are three negative roots if and only if $traceJ<0$, $c_2>0$ and $|J|<0$. In this case the steady state is stable. On the other hand, there are three positive roots if and only if $traceJ>0$, $c_2>0$ and $|J|>0$ in this second case, and the steady state is unstable. The other possibilities give involve a combination of positive and negative roots that result in a conditionally stable equilibrium, that is, there is a stable manifold or stable arm associated with that equilibrium.

When natural capital is endogenous, the system is defined by expressions 5.8 and 5.9. Linearization results in a system whose Jacobian is:

$$J=\begin{pmatrix} J_{11} & J_{12} & J_{13} \\ J_{21} & J_{22} & J_{23} \\ J_{31} & J_{32} & J_{33} \end{pmatrix}$$

where

$$\begin{aligned}
J_{11} &= F'(K) \\
J_{12} &= -N\cdot a_g \\
J_{13} &= N(a_l - a_g) \\
J_{21} &= -s_{ng}(1-s_{ng})\sigma - s_{ng}s_l\theta \\
J_{22} &= -(1-s_{ng})\alpha - s_l\beta + s_{ng}\alpha - s_{ng}(1-s_{ng})\lambda \\
J_{23} &= -s_{ng}\beta - s_{ng}s_l\varepsilon \\
J_{31} &= s_l(1-s_l)\theta + s_l s_{ng}\sigma \\
J_{32} &= s_l\alpha + s_l s_{ng}\lambda \\
J_{33} &= (1-s_l)\beta + s_{ng}\alpha - s_l\beta + s_l(1-s_l)\varepsilon
\end{aligned}$$

and where additionally we have defined $\theta = \dfrac{\partial R}{\partial K}$

K, s_l and s_{ng} take different values depending on the specific steady state we consider.

Proof of proposition 5.4

Homogeneous all-ecolabel equilibrium (s_l=1),

$$|J| = F'(K)\beta\Omega$$

$$\text{trace}J = F'(K) - \beta - \Omega$$

$$c_2 = -F'(K)\Omega - F'(K)\beta + \beta\Omega$$

The determinant and trace are negative and c_2 positive if and only if $F'(K)<0$, $\beta>0$, and $\Omega>0$ in the steady state. This is guaranteed for $F'(K)<0$ and $R(1,K)>c(a_l)$. For any other combination, either the determinant is positive, or a positive c_2 and a negative trace cannot coexist.

Homogeneous all-green equilibrium (s_l=0; s_{ng}=0),

$$|J| = -F'(K)\alpha\beta$$

$$\text{trace}J = F'(K) + \beta - \alpha$$

$$c_2 = F'(K)\beta - F'(K)\alpha - \beta\alpha$$

This equilibrium could be stable if $F'(K)<0$, $\alpha>0$, and $\beta<0$. For any other combination, either the determinant is positive, or a positive c_2 and a negative trace cannot coexist. However, it is impossible that $\alpha>0$ for s_{ng}=0, given that we have assumed $c(a_g)\geq 0$. Thus, homogeneous all-green equilibria are always unstable.

Homogeneous all-non-green equilibrium (s_{ng}=1),

$$|J| = F'(K)\alpha\Omega$$

$$\text{trace}J = F'(K) + \alpha + \Omega$$

$$c_2 = F'(K)\Omega + F'(K)\alpha + \alpha\Omega$$

The determinant and trace are negative and c_2 positive if and only if $F'(K)<0$, $\alpha<0$, and $\Omega<0$ in the steady state. For any other combination, either the determinant is positive, or a positive c_2 and a negative trace cannot coexist.

Proof of proposition 5.6

Here we analyze the stability of heterogeneous equilibria where only two strategies exist.

Heterogeneous equilibria composed of non-green and green firms

$$|J| = -s_{ng}(1-s_{ng})\beta\left[F'(K)\lambda + N\cdot a_l\sigma\right]$$

$$\text{trace}J = F'(K) - s_{ng}(1-s_{ng})\lambda + \beta$$

$$c_2 = -s_{ng}(1-s_{ng})\frac{|J|}{\beta} + \beta\left[F'(K) - s_{ng}(1-s_{ng})\lambda\right]$$

Given that we have assumed $c(a_l)>c(a_g)$, necessarily $\beta<0$. Given this, if $F'(K)>0$, then the determinant is positive. If $F'(K)<0$, the trace is negative, and a necessary condition for the determinant to be negative is $\lambda + \frac{N\cdot a_g}{F'(K)}\sigma > 0$, which is also sufficient for c_2 to be positive. Therefore, the steady state is stable if and only if $F'(K)<0$, and $\lambda + \frac{N\cdot a_g}{F'(K)}\sigma > 0$.

Heterogeneous equilibria composed of green and ecolabel firms

$$|J| = s_l(1-s_l)\alpha\left[-F'(K)\varepsilon + N(a_l - a_g)\theta\right]$$

$$\text{trace}J = F'(K) + s_l(1-s_l)\varepsilon - \alpha$$

$$c_2 = -s_l(1-s_l)\left[\theta N(a_l - a_g) - \varepsilon F'(K)\right] - \alpha\left[F'(K) - s_l(1-s_l)\varepsilon\right]$$

The assumption $c(a_g)\geq 0$ implies that, in this equilibrium, necessarily $\alpha\leq 0$. Given this, $F'(K)<0$ implies a positive trace, and $F'(K)>0$ implies that a negative trace and positive c_2 cannot coexist. Thus, this equilibrium is always unstable.

Heterogeneous equilibria composed of ecolabel and non-green firms

$$|J| = -s_l(1-s_l)\alpha\left[F'(K)(\lambda-\varepsilon) + N\cdot a_l(\sigma+\theta)\right]$$

$$\text{trace}J = F'(K) + \alpha + s_l(1-s_l)(\varepsilon-\lambda)$$

$$c_2 = \alpha[F'(K) - s_l(1-s_l)(\lambda-\varepsilon)] - s_l(1-s_l)[F'(K)(\lambda-\varepsilon) + N\cdot a_l(\sigma+\theta)]$$

These three conditions are only met simultaneously when $F'(K)<0$, $\alpha<0$, $\varepsilon<\lambda$, and $(\lambda-\varepsilon) + \frac{N\cdot a_l}{F'(K)}(\sigma+\theta) > 0$. For other situations, either the determinant is positive, the trace is positive, a positive c_2 and negative determinant cannot coexist, or, finally, a positive c_2 and negative trace cannot coexist.

Proof of proposition 5.7

Heterogeneous equilibria where the population is composed of ecolabel, green and non-green firms (s_{ng},s_l), for $(s_{ng} + s_l) \in (0,1)$,

$$|J| = s_{ng}s_l(1-s_{ng}-s_l)\left[-F'(K)\lambda\varepsilon + N(a_l - a_g)\lambda\theta - N\cdot a_g\sigma\varepsilon\right]$$

$$\text{trace}J = F'(K) - s_{ng}(1-s_{ng})\lambda + s_l(1-s_l)\varepsilon$$

$$c_2 = F'(K)[-s_{ng}(1-s_{ng})\lambda + s_l(1-s_l)\varepsilon] - \lambda\varepsilon s_{ng}s_l(1-s_{ng}-s_l) -$$

$$-N(a_l - a_g)[s_l(1-s_l)\theta + s_l s_{ng}\sigma] - N\cdot a_g[s_{ng}(1-s_{ng})\sigma + s_{ng}s_l\theta]$$

For *F'(K)*>0, it is necessary that $s_l(1-s_l)\varepsilon - s_{ng}(1-s_{ng})\lambda < 0$ for the trace to be negative, but this determines that c_2 is negative. Therefore, there cannot be three positive roots and *c'* is not stable.
For *F'(K)<0,* it is necessary that $F'(K)\lambda + Na_g\sigma > 0$ for the determinant to be negative. This is not compatible with c_2 being positive. Thus, there cannot be three positive roots and *c''* cannot be stable.
For *F'(K)*>0, it is necessary that $F'(K)\varepsilon - N(a_l - a_g)\theta < 0$ for the determinant to be positive, and this implies that c_2 is negative. Consequently, there cannot be three negative roots and *c'* cannot be unstable.
For *F'(K)<0,* it is necessary that $s_l(1-s_l)\varepsilon - s_{ng}(1-s_{ng})\lambda > 0$ for the trace to be positive. This determines that c_2 is necessarily negative. Therefore, there cannot be three negative roots and *c''* cannot be unstable.
Thus, the roots of the characteristic equation are always a combination of positive and negative values. This steady state is, consequently, conditionally stable.

Proof of proposition 5.8

Since the determinant of the homogeneous all-ecolabel equilibrium *d''* is $|J|_{d''} = F'(K)\beta\Omega$, this is equal to zero when $\Omega = 0$ evaluated in that point, that is to say, when $\delta(0,\hat{K}) + R(1,\hat{K}) = c(a_l)$, or equivalently, $R(1,\hat{K}) = c(a_l)$.

Proof of proposition 5.9

Given that the determinant of a heterogeneous equilibrium composed of ecolabel and non-green firms *a''* is $|J|_{a''} = -s_l(1-s_l)\alpha[F'(K)(\lambda-\varepsilon)+N\cdot a_l(\sigma+\theta)]$, this is equal to zero when $F'(K)(\lambda-\varepsilon)+N\cdot a_l(\sigma+\theta)=0$, or $(\lambda-\varepsilon)+\frac{N\cdot a_l}{F'(K)}(\sigma+\theta)=0$, evaluated at that point.

Proof of proposition 5.10

When *a''* and *c''* coincide in a single equilibrium, in that equilibrium (s_{ng}+s_l)=1 (as defined by *a''*) and α=0 (as defined by *c''*).
The determinant of *a''*, $|J|_{a''} = -s_l(1-s_l)\alpha[F'(K)(\lambda-\varepsilon)+N\cdot a_l(\sigma+\theta)]$, is equal to zero when α=0. Then, *a''* becomes non-hyperbolic.
The determinant of *c''*,
$|J|_{c''} = s_{ng}s_l(1-s_{ng}-s_l)[-F'(K)\lambda\varepsilon+N(a_l-a_g)\lambda\theta-N\cdot a_g\sigma\varepsilon]$, is equal to zero when (s_{ng}+s_l)=1. Then *c''* becomes non-hyperbolic.
Thus, when *a''* and *c''* coincide in one equilibrium, it is non-hyperbolic.

Chapter 6: Conclusion

It is common to argue that unregulated contexts lead to overexploitation and exhaustion of Common Pool Resources (CPR) due to free-riding behavior of agents. Under this assumption, there is no scope for voluntary environmental initiatives, and public intervention is considered essential to avoid overexploitation of natural resources. However, there is a body of literature on the management of natural CPRs that shows that voluntary environmental initiatives that avoid tragedy outcomes are a theoretical possibility and an empirical reality.

Voluntary environmental initiatives are receiving increasing attention among business leaders, academics, investors, and governments as a relevant policy alternative. This rising recognition is fostered by the desire to find cost-effective solutions to environmental problems, adopt a cooperative approach between industry and governments, and help prevent the negative legal and political consequences associated with regulatory failure.

Exploring the validity of this policy approach requires an understanding of the mechanism that underlies the emergence and stability of voluntary environmental initiatives under different contexts. Scholarship on CPRs has shown that voluntary environmental initiatives are widespread, but that their emergence is not guaranteed. This finding has prompted a broad body of theoretical and empirical literature that examines how different agents make use of CPRs under different incentive structures. This literature, however, has not yet addressed voluntary environmental initiatives and the management of CPRs in tourism.

This study has analyzed the incentives for users of CPRs in tourism to undertake voluntary environmental initiatives, and how changes in the institutional setting affect these incentives. More precisely, this study is an attempt to answer the following research questions: (1) Which incentives motivate the emergence of voluntary environmental initiatives in tourism? (2) How do institutions affect tourism firms' incentives to undertake voluntary environmental action? (3) Are the effects of command-and-control regulations different from those derived from social norms or self-motivation? (4) Does certification of voluntary environmental initiatives make a difference in the structure of tourism firms' incentives? (5) How do stocks of natural capital affect tourism firms' incentives for undertaking voluntary environmental initiatives?

We have addressed these questions from a conceptual approach embedded in the Institutional Analysis and Development Framework (IAD). Chapter 2 has presented the IAD, showing its applicability to the tourism field, and highlighting its potential contribution to the current body of research on the management of natural CPRs in tourism. The argument we have defended is that the IAD is suitable for application to the complex tourism phenomenon. We have presented an example of how one recent extension of the IAD framework designed for social-

ecological systems can be applied to analyze stylized characteristics of successful voluntary environmental initiatives at nature-based tourism destinations. This exercise has enabled us to identify various attributes of the main components of the IAD that are relevant to the success of voluntary environmental initiatives in the tourism industry. This analysis has provided the basis for the rest of the dissertation, as subsequent chapters have addressed some of these attributes, namely market conditions, participants, institutions, and quality of the natural CPR, as first presented in figure 1.1. Chapters 3 to 5 have presented a set of interrelated game-theory models that analyze a population of tourism firms that make use of a natural CPR and that are subject to certain assumptions regarding market conditions. The main assumption, inspired by empirical evidence, is that tourism firms can charge price premiums as a result of their environmental efforts.

First, chapter 3 has developed a very simple static model that constitutes the baseline. This model envisages that production of tourism services by firms generates some negative environmental externalities, which can be mitigated by the adoption of voluntary unilateral commitments. This initial model allows for asymmetries in the profit functions of firms. This is one of the methodological alternatives that enable us to theoretically reproduce the empirical finding that some tourism firms develop voluntary environmental initiatives and others do not. In this game, we have identified the structure of payoffs that leads to a Nash equilibrium where preferred strategies for each player are different.

Next, the open access model has been expanded in chapter 4 by introducing a third player, the government, which makes the game sequential. In this way, we have analyzed the effect on the environmental behavior of firms of imposing an environmental standard in contexts where voluntary action is possible. Given the nature of the environmental regulation, this model incorporates the possible emergence of administrative corruption in the form of bribery of inspectors by firms to obtain favorable assessments of their compliance with the standard.

Finally, chapter 5 has built upon the profit functions of firms presented in the baseline model to develop several evolutionary games. We have separately presented the dynamic games for unilateral commitments and an extension by considering the introduction of an ecolabel. In this chapter, we rule out asymmetries in payoff functions of firms and present models considering the dynamics of the natural resource both as an exogenous and an endogenous variable.

As a result of these research efforts, we have expanded the state of knowledge on the strategic incentives of tourism firms to undertake voluntary environmental initiatives. Our findings enable us to provide a (partial) response to the research questions considered at the beginning of the study. We now compile our findings from the different chapters of the dissertation and organize them according to our initial research questions.

1. Which incentives motivate the emergence of voluntary environmental initiatives in tourism?

From the analysis of the literature on voluntary environmental action in tourism, we find that both monetary and non-monetary motivations support the emergence and stability of voluntary environmental initiatives in tourism.

Various **monetary motivations** have been reported in the mainstream literature on voluntary environmental initiatives, including regulatory gains, demand effects, cost efficiency and technical assistance. However, in tourism settings, demand effects are the most extensively considered monetary motivation, since their empirical relevance has been better documented. Demand effects are considered to be relevant when there are market implications of product differentiation resulting from consumers being concerned about the environmental features of a particular good or service.

As supported by the empirical literature, we have described three different price premiums that are present at nature-based destinations as a result of unilateral commitments and ecolabels. First, firms that preserve the natural environment beyond the legally mandated level can obtain a premium from green differentiation. Empirical evidence shows that in tourism it pays to be green. Second, tourism firms that belong to an ecolabel can obtain a reputation premium based on their environmental efforts. Empirical findings show that hotels enrolled in certification programs charge significantly higher room prices or have higher occupation rates. Finally, empirical estimates show that tourists are willing to pay extra for improvements in the environmental quality at destinations. Thus, a price premium for increased environmental quality, considered non-excludable by the tourism literature, might be in place.

A second type of incentive that the mainstream literature considers when analyzing voluntary environmental initiatives is **non-monetary motivations**. These can emerge either via the intrinsic motivation of agents and/or informal social benefits derived from following behavioral norms. Empirical evidence shows non-monetary motivations being relevant in tourism, but no strategic analysis of their presence has been conducted previously.

According to Motivational Crowding Theory, agents are considered to be intrinsically motivated to perform an activity when one receives no apparent reward except the activity itself. Empirical findings supporting intrinsic motivation in tourism include firms' perceived responsibility in addressing environmental problems affecting their environmental strategies. In addition, following certain norms of agreed-upon behavior for the management of a natural CPR can be positively recognized by other community members using this resource, entitling that user to become part of a group and receive certain privileges as a result. Several examples of the impact of social pressure on the tourism industry are documented in the literature.

The analytical part of this dissertation (including chapters 3, 4 and 5) considers these monetary and non-monetary motivations to analyze the selection of environmental strategies by tourism firms. Chapters 3 and 4 develop non-cooperative one-shot games to analyze the implementation of unilateral commitments by potentially heterogeneous firms, and chapter 5 develops a set of evolutionary games for the analysis of unilateral commitments and ecolabels by homogeneous firms. As a result of both methods of analysis, we can identify different configurations of equilibria depending on the values of parameters considered in the games. We can identify conditions under which no voluntary environmental action occurs, others under which a heterogeneous population of firms implements voluntary environmental initiatives and non-green firms can exist in the long run, and finally, others under which all firms engage in voluntary environmental initiatives. Chapters 3 and 4 find that when premiums for increased environmental quality in the region are sufficiently high, all firms using the CPR might undertake unilateral commitments, whereas in chapter 5, due to the dynamic and naïve behavior of firms, the strategic relevance of this premium disappears and populations in which all firms engage in voluntary initiatives can only be sustained under an ecolabel.

Thus, our models reproduce real-world situations in tourism and contribute to the theoretical work to explain these realities. The empirical evidence from tourism is more suggestive of the existence of situations where no environmental action is undertaken or where some agents undertake environmentally-friendly strategies and others do not.

2. How do institutions affect tourism firms' incentives to undertake voluntary environmental action?

As shown in figure 1.1, we have considered different institutional designs throughout the different chapters of the dissertation. Chapter 4 considers norms of behavior, regulation, corruption and unregulated tourism, and chapter 5 addresses certified environmental practices (ecolabels). We have explored the implications of each of these institutions for the incentives of tourism firms to undertake voluntary environmental action, focusing on some particular situations (defined by the assumptions specified in each model). As a result, we can show that all of these institutions influence the incentives of tourism firms to develop voluntary environmental initiatives.

Norms of behavior: Norms of behavior are one of the sources of non-monetary motivations already commented on. Users of CPRs can develop shared concepts of what must, must not or may be appropriate actions or outcomes in particular types of situations. When comparing the game in chapter 3 with that of chapter 4, we can see that the existence of these motivations fosters voluntary environmental initiatives by including non-profit-oriented preferences on how individuals prefer to behave and the kind of outcomes they want for themselves and

others. Given the simple dichotomous modeling of the presence of these preferences in firms' utility functions, non-monetary motivations change the strength of the incentives to undertake voluntary initiatives, but do not qualitatively change the strategic interaction of firms.

Regulation: We have analyzed the effects of the introduction of an environmental standard in situations where there is the potential for voluntary environmental action in the open access. In accordance with some empirical evidence, we have explored situations in which regulation crowds-out non-monetary motivations. For comparability purposes, we have assumed that individual abatement levels required by regulation are strictly equal to abatement efforts undertaken under voluntary initiatives. As a result, we have seen that the result of the command-and-control imposition in terms of strategy selection by firms depends on the relationship between non-monetary motivations present in the open access and the magnitude of fines resulting from undercompliance. When fines resulting from undercompliance are more motivating than non-monetary motivations in the open access, the regulation either improves or does not change the environmental quality of the CPR. However, when the expected fines resulting from undercompliance are of lower value than the non-monetary motivations, environmental quality does not change or even worsens after the introduction of the standard.

Corruption: In this dissertation, we address the "administrative corruption" that involves bribery to distort the implementation of existing regulations. Bribery of environmental inspectors has been reported as a frequent activity in some tourism contexts, resulting in the inability of the formal state to enforce environmental legislation. We have analytically shown that corruption emerges when there are profits to be obtained from that behavior, both for firms and inspectors. Instead of identifying the actual bribes being paid (e.g., by ultimatum offers or Nash bargaining), we have defined the range of values for bribes that guarantees those extra profits from corruption for firms and inspectors. The emergence of corruption affects the enforceability of regulation. This is the case because when corruption is possible, firms that are affected by a regulation make their environmental decisions based on expected costs of undercompliance, those being either the expected fines resulting from failure to comply with the regulation or the expected costs of bribery, whichever is cheaper.

Furthermore, the emergence of corruption might qualitatively change the strategic incentives of tourism firms. When extra profits from corrupt behavior are greater than incentives to implement green differentiation, the configuration of equilibria varies and firms tend to follow pooling strategies. Consequently, potential improvements or detriments of environmental quality resulting from the government's intervention are more intense.

Unregulated operators: The existence of firms operating informally can make the imposition of a regulation ineffective in improving environmental quality. Unregulated operators are widely present in tourism economies, and despite the fact that they are not subject to command-and-control intervention, changes in the regulatory setting affect their incentives to undertake voluntary environmental ini-

tiatives due to the strategic interaction among firms. When these firms are present, regulation can be ineffective since compliance by regulated firms may induce unregulated firms to cease to make voluntary contributions.

Ecolabel: Unlike regulation, an ecolabel, is a form of institutional change that is based on voluntary adherence of firms. We analyze the consequences of the strategic incentives of firms to undertake unilateral commitments resulting from the creation of an ecolabel as a second environmental strategy that firms can select. We do not explicitly model the process of creation of the ecolabel, but rather analyze the change in strategy selection by firms once the ecolabel has been exogenously created.

There are scenarios in which this institutional change prospers and others in which it disappears in the long run. Whether an ecolabel prospers depends on the existence of equilibria in which a positive proportion of firms adhere to the ecolabel, on the stability of these equilibria, and on the initial situation of the system in the dynamics. According to our model, crucial determinants of whether one or another long run behavior of the system is achieved depend on the institutional setting, the initial proportion of promoters of the ecolabel, the type of firms that act as promoters, the extent to which unilateral commitments are undertaken at the moment of the institutional change, and the environmental quality of the CPR.

The institutional setting defines the abatement costs of voluntary initiatives. These determine bifurcation points of the system as explored in the sensitivity analysis: the lower the surplus costs for green firms to certify their environmental behavior, the higher the possibility that the ecolabel exists as a long run strategy. Further, for an ecolabel to exist in the long run, it is necessary that a minimum proportion of promoters support the certification from its very beginning. The size of this initial group is contingent upon the type of promoting firms: the higher the proportion of non-green firms joining, the larger the size of group. In addition, the spread of unilateral commitments before the introduction of the ecolabel is also relevant. If the ecolabel is introduced too early in the implementation of unilateral commitments, certification can erode the environmentally-friendly path by inducing green firms to join an ecolabel that cannot gather enough members to subsist in the long run. Moreover, above a certain threshold of unilaterally committed firms, the higher the proportion of firms undertaking unilateral commitments, the higher the minimum number of promoting firms required for the ecolabel to succeed[1]. Finally, as it is explained in research question 5, both the initial and steady state levels of natural capital affects the success of the ecolabel.

In sum, our results show that institutional change aimed to improve the environmental quality of the CPR can lead to its desired objectives, but also to unexpected results. When norms of behavior are present and corruption is possible, or when there are unregulated firms, a standard can result in expected outcomes. However, we have identified scenarios under which an environmental standard,

[1] Provided that there exists a stable equilibrium with ecolabel firms.

when corruption is possible, either decreases or does not change the environmental quality of the CPR. In addition, a standard may not improve environmental quality due to existence of unregulated operators. Further, the introduction of an ecolabel can succeed in attracting members in the long run. But it is possible that an ecolabel increases the proportion of firms that do not engage in any abatement activity or does not change the composition of the population of firms.

3. Are the effects of command-and-control regulations different from those derived from social norms or self-motivation?

This research question refers to potential qualitative differences in the strategic behavior of tourism firms under formal (command-and-control regulation) and informal (norms of behavior or self-motivation) institutions (addressed in chapter 4). Our results show that when the legal system is capable of avoiding administrative corruption that distorts the implementation of command-and-control environmental regulation, there is no qualitative difference in the structure of incentives defining the environmental behavior of tourism firms. That is to say, the introduction of a regulation in a setting where there is no corruption only modifies the magnitude of the incentives to undertake unilateral commitments, but does not vary the structure of the game. Under the assumption that public intervention crowds-out voluntary initiatives, if expected fees resulting from undercompliance with the standard are as relevant as non-monetary motivations (i.e., intrinsic motivation or as social pressures), the environmental behavior of firms will not change when switching from informal to formal institutions (as long as the abatement required by the standards equals abatement voluntarily undertaken).

However, when the legal system is not capable of avoiding corruption and profits obtained from corruption are higher than price premiums from green differentiation, firms' incentive structure is substantially modified. As a result, firms' environmental strategies tend to converge to pooling equilibria more easily and, for better or worse, agents' behavior becomes more extreme. This is the case because now pooling equilibria can also emerge from what we call the *induced* behavior of the firms to (under)comply. By *induced* behavior of a firm, we mean that strategic incentives for that firm are such that it has no dominant strategy and follows the other firms' behavior.

4. Does certification of voluntary environmental initiatives make a difference in the structure of tourism firms' incentives?

Certification of voluntary environmental initiatives affects the structure of incentives of tourism firms to engage in voluntary environmental initiatives by modifying the incentives to undertake unilateral commitments as well as by creating a new strategy that requires solving a coordination problem for its creation (these considerations have been addressed in chapter 5).

First, we have assumed that green market niches confer extra value to certified environmental initiatives. As a result of this extra value, our results show that enabling firms to certify their abatement efforts affects the **incentives to undertake unilateral commitments**. As already mentioned in research question 2, there are scenarios in which ecolabels prosper and others in which they disappear in the long run. In any case, the introduction of a certification scheme modifies the dynamic behavior of the system.

When an ecolabel prospers, it can attract the whole population of tourism firms or only a certain proportion of the population. Whatever the final proportion of firms adhered to the ecolabel, the certification scheme absorbs all unilateral commitments that were initially present. Equilibria with the three strategies can exist, but cannot be stable. Beyond a certain size of the ecolabel, it is more profitable for firms undertaking uncertified environmental practices to develop further abatements and become members of the ecolabel. When an ecolabel succeeds, the proportion of firms that do not develop any abatement process is lower and the environmental quality of the CPR is higher compared with the scenario prior to the creation of the ecolabel.

Further, there are situations in which the creation of an ecolabel does not prosper in the long run. Even when it collapses, the creation of the ecolabel might distort the incentives to undertake unilateral commitments. By introducing the ecolabel, the feasible region of compositions of the population is expanded, influencing the dynamics and the steady state configurations of the population. There are some cases in which the creation of the ecolabel induces temporary variations in the composition of the population of users, but leads in the long run either to the initial situation or the situation that would have been reached anyway if no ecolabel had been created. In these cases, the ecolabel is, in the long run, nothing but a waste of the time and resources required for its creation. Other more gloomy scenarios can also be created under which the emergence of an ecolabel truncates incipient developments of unilateral commitments by users of the CPR, leading to a population where no firms undertake voluntary initiatives and lower environmental quality results.

Second, certification makes a difference in the structure of incentives of tourism firms by requiring firms to solve a **coordination problem** so that a sufficient number of promoters initially join the ecolabel. Our results show that certified environmental practices cannot become long run strategies unless a minimum pro-

portion of promoters is achieved. This is the case because the reputation premium depends positively on the number of ecolabel firms, and this premium must at least compensate for the extra abatement costs of joining the ecolabel. This finding is consistent with empirical evidence in tourism supporting that there is a critical mass of 3 to 10 percent of firms operating in a region that must belong to the initiative to credibly present the ecolabel to the tourism market and to offer a real consumption choice to the consumer.

This result shows a fundamental difference between the two voluntary initiatives: unilateral commitments can be initiated by a single firm, whereas some coordinated action among tourism stakeholders is required to organize an initial group of promoters. This difference between the voluntary initiatives can be conceptualized under Ostrom's (2000) (empirically based) presentation of users of a CPR as facing two social dilemmas at different levels to increase the sustainability of socio-ecological systems. In the first-level dilemma, each individual would like others to refrain from their use of the resource, while each wants to use it freely. In the second-level dilemma, users face a public goods problem related to the creation of new institutions to better manage their resources. Unilateral commitments based on green differentiation can provide the required incentives to solve the first-level dilemma for environmental management at nature-based tourism destinations. Coordination mechanisms to create the ecolabel would belong to the second-level dilemma. Analyzing the mechanism capable of solving that second dilemma requires its own specific research method and is beyond the scope of the present dissertation.

5. How do stocks of natural capital affect tourism firms' incentives for undertaking voluntary environmental initiatives?

When endogenously considering the dynamics of the stock of natural capital of the CPR (chapter 5), it can be seen that it influences the structure of incentives of tourism firms to undertake voluntary environmental initiatives. We have considered a renewable natural resource that requires a minimum level of stock to have a positive replenishment capacity. Therefore, below that level of natural capital, extinction of the resource is inevitable regardless of the environmental behavior of the population of users. For higher values of the stock of natural capital, the initial endowment of environmental quality jointly with the steady-state value of natural capital determines the equilibria to be reached by the system.

First, the initial state of the CPR constrains the possible dynamics of the system. Second, the higher the steady-state level of natural capital, the easier it is to maintain groups of firms undertaking voluntary environmental initiatives. More specifically, when all the steady-state levels of natural capital are below the value of environmental quality that makes premiums from green differentiation strictly compensate for the derived abatement costs, no firm will engage in unilateral

commitments. Moreover, when all the steady-state levels of natural capital are below the values of environmental quality that allow price premiums to strictly compensate for abatement costs to become members of an ecolabel, no firm certifies its environmental practices. Therefore, as is often neglected in the literature, the level of natural capital that the resource can steadily maintain is crucial to guarantee a demand effect large enough to make possible voluntary initiatives in the long run.

In addition, given that abatement efforts by firms can not preclude all environmental damage resulting from operation of the industry, voluntary environmental initiatives can not avoid tragedy results when we allow increases in the number of users of the CPR. When there is no restriction in the number of firms that can use a particular CPR and there are incentives for new firms to enter into this market, incentives to undertake voluntary environmental initiatives might get eroded. Thus, firms might abandon their green-niche, eventually leading to pressures above the regeneration capacity of the resource and therefore to its extinction.

In sum, this study supports the idea that voluntary environmental initiatives in nature-based tourism destinations constitute a much more complex social-ecological system than the tragedy of the commons model described by Hardin (1968). Thus, the application of Hardin's point of view as a panacea solution to CPR situations in the tourism industry is strongly misleading. The present study has proposed the IAD framework as one way in which the tourism literature could benefit from prior knowledge on how agents make decisions under different institutional designs. We have built on the mainstream literature on strategic behavior of users of CPR and voluntary environmental initiatives to analyze the incentives to undertake voluntary environmental initiatives by tourism users of CPRs and how changes in the institutional setting affect these incentives. As a result, we believe that with the present contribution, the tourism literature has benefited from prior knowledge of how agents make decisions under different institutional designs in non-tourism settings, and the mainstream literature has expanded its scope.

There are several natural extensions that can be developed from the model presented in this chapter.

First, the level of abatement efforts could be considered a choice variable. Following a closely related literature on voluntary environmental initiatives by users of CPR (Osés & Viladrich, 2007; Sethi & Somanathan, 1996), the models developed in this study consider abatement efforts by firms as a dichotomous variable. Firms either undertake or do not undertake voluntary environmental practices. Future research could extend our models to incorporate the level of abatement efforts as a decision variable by introducing optimization mechanisms of abatement decisions. To do so, it could be assumed that the level of abatement by firms constitutes one of the attributes of premiums from green differentiation or reputation premiums. By further considering some assumptions about the first and second de-

rivatives of price premiums and the cost function, optimum abatement levels under different voluntary initiatives could be obtained. Making the decision on abatement levels more flexible would enable researchers to better analyze environmental and welfare impacts of institutional change.

Second, our research could be extended to endogenously consider decision-making of tourists and the government. On the one hand, following the literature on demand for green attributes in industrial economics, chapters 3 and 4 could be extended by including a last step in the game where oligopolistic competition between firms facing the green demand takes place. Alternatively, the demand market could be endogenized by considering Tour Operators as intermediaries between supply and demand that might recognize green preferences of consumers. Calveras (2003, 2007) and Calveras and Vega-Hernández (2005) analyze the effect of Tour Operators in a oligopolistic market and address the incentives to voluntary environmental action. These studies could be extended by incorporating the market conditions that are considered throughout the dissertation. On the other hand, the decision processes by the government in chapters 4 and 5 could be endogenously incorporated. This would enable researchers, for example, to better explore the relationship between stringency of regulation and voluntary abatement in chapter 4, and its consequences in terms of stability of heterogeneous populations of firms in chapter 5.

Third, the host community of the region where the CPR is located could be taken into account in future research. There is empirical literature supporting the contention that residents might engage in unfriendly behavior against the tourism industry or tourists due to environmental concerns. The host community could be incorporated by considering thresholds of environmental damage or number of tourists (congestion) that residents will tolerate before beginning to boycott the tourism industry. Another option would be to consider an indirect effect of residents over the tourism industry by lobbying the government, so that environmental regulations and the like are introduced to control damage by the tourism industry.

Fourth, the analysis could be extended to relate different social-ecological systems within tourism. We have assumed that strategic incentives between users of a CPR are not affected by the environmental management at other destinations. However, in a global industry such as tourism, the response to the environmental efforts at one destination is highly affected by environmental developments at others. Thus, it might be interesting to explore how the incentives to engage in environmentally-friendly strategies at one destination are affected by the emergence or improvement of other nature-based destinations. Future research could address, for example, an international green niche of tourists who determine their consumption choices by considering several destinations. As a result, differentiation premiums might not totally disappear when all firms using a particular CPR are green. Thus, the concept of "coopetition" in the tourism literature (Edgell, 2002) could be analytically addressed by considering that firms using a particular CPR cooperate to attract tourists to the destination and later compete at the destination level.

References

Calveras, A. (2003). Incentives of international and local hotel chains to invest in environmental quality. *Tourism Economics*, 9, 297-306.

Calveras, A. (2007). Expansion of a hotel chain and environmental quality. *Investigaciones económicas*, XXXI, 263-295.

Calveras, A., & Vera-Hernández, M. (2005). Quality externalities among hotel establishments: what is the impact of tour operators? *Tourism Economics*, 11, 571-593.

Edgell, D. L. (2002). *Best practices guidebook for international tourism development for rural communities*. Provo, Utah: Bringham Young University.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 163 (13), 1243-1248.

Osés, N., & Viladrich, M. (2007). On the sustainability of common property resources. *Journal of Environmental Economics and Management*, 53, 393-410.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives*, 14 (3), 137-158.

Sethi, R., & Somanathan, E. (1996). The evolution of social norms in common property resource use. *American Economic Review*, 86 (4), 766788.