

Fondazione Eni Enrico Mattei

Biodiversity and Globalization

Geoffrey Heal

NOTA DI LAVORO 101.2002

NOVEMBER 2002

ETA – Economic Theory and Applications
--

Geoffrey Heal, *Columbia Business School, New York, USA*

This paper can be downloaded without charge at:

The Fondazione Eni Enrico Mattei Note di Lavoro Series Index:

http://www.feem.it/web/attiv/_wp.html

Social Science Research Network Electronic Paper Collection:

http://papers.ssrn.com/abstract_id=XXXXXX

The opinions expressed in this paper do not necessarily reflect the position of
Fondazione Eni Enrico Mattei

Biodiversity and Globalization

Summary

Reduction of the earth's biodiversity as a result of human activities is a matter of great concern to prominent scientists. What are the economic aspects of this loss? In economic terms, what is biodiversity and why might it matter? And is the loss of biodiversity in any way connected with globalization of the economy?

Keywords: Biodiversity, public goods, globalization, bundling

Written for and presented at the Kiel Week Conference on Globalization, 2002, Institute for World Economics, Kiel, Germany

Address for correspondence:

Geoffrey Heal
Garrett Professor of Public Policy & Corporate Responsibility
Graduate School of Business
Columbia University
616 Uris Hall
3022 Broadway
New York NY 10027-6902
USA
Phone: +212+854+6459
Fax: +212+316+9219
E-mail: gmh1@columbia.edu

Biodiversity and Globalization¹

Geoffrey Heal

Columbia Business School

July 2002

What is the issue?

There is a general scientific consensus that we are losing biodiversity at a rate greatly in excess of that which has been normal for much of human history. It is also agreed that this loss is largely attributable to human activities. Loss of biodiversity is driven largely by destruction of the habitats of the species that are becoming extinct, a product of the need to clear land for housing, growing food and providing firewood. Behind this increasing pressure on space is of course the great growth of the human population, from about one and a half billion in 1900 to six billion in 2000 and quite possibly to ten billion by 2050. Population growth, habitat loss and biodiversity loss are global problems, in the sense that they are occurring globally and have global consequences. But they are not problems of globalization: they are not driven by the expansion of international trade and capital movements, nor the possible cultural homogenization, which we associate as part of the phenomenon called globalization.

Another factor that may already be contributing to the loss of biodiversity, and will probably contribute much more in the future, is climate change. Again, this is a global

¹ Written for and presented at the Kiel Week Conference on Globalization, 2002, Institute for World Economics, Kiel, Germany.

problem but not really a problem of globalization. It is global in that it occurs at a global level and has to be solved at this level. But it is driven by economic growth and concomitant increases in energy use, which is a distinct issue from the expansion of trade and capital flows.

In the balance of this paper I set out briefly the economic consequences of biodiversity loss, and then argue that as a global problem it needs global solutions, and suggest that further globalization, in the sense of the development of global economic institutions, including markets, is a prerequisite for solving the problems posed by biodiversity loss. The central point here is that the willingness to pay for conservation and for the services that biodiversity provides is located largely in the rich countries, whereas the biodiversity itself is mainly in poor countries. Conservation requires institutions that turn this willingness to pay into cash flows from rich to poor countries, cash flows that are conditional on conservation and provide incentives for conservation. I review several mechanisms that could be important in achieving this.

Biodiversity as a commodity

I have set out elsewhere the characteristics of biodiversity as an economic commodity (Heal 2000). It provides human societies with a number of important services, which include enhancing the productivity and resilience of natural and agricultural ecosystems, providing insurance against attacks on agricultural crops by pathogens, and providing us with valuable knowledge of novel genetic and molecular forms.

The relationship between biodiversity and the productivity and resilience of natural ecosystems has been a topic of intense and sometimes controversial research amongst ecologists over the last decade (Tilman et al., Hooper and Vitousek, Grime). The controversy is associated mainly with the mechanisms through which increased diversity affects the resilience of natural ecosystems: there is general agreement that more diverse systems are more resilient in the face of natural and anthropogenic variations in their environment (Walker Kinzig and Langridge). Systems that are species poor relative to their natural state are vulnerable to collapse through predation, through introduced species and through climatic variations.

Biodiversity contributes to the productivity of agricultural ecosystems through a rather different mechanism. Access to the genetic diversity stored in wild races of plants and animals has been critical in raising the productivity of commercially valuable species. Indeed the US Office of Technology Assessment estimated that over \$1 billion has been added to the value of US agricultural output alone each year since the Second World War because of plant breeder's access to the biodiversity of wild races. This diversity operates as a source of characteristics that can be used to increase the productivity of commercial crops by cross breeding or genetic engineering. Historically these characteristics have included heat resistance, short stems (which reduce vulnerability to wind damage), and resistance to pathogens. Ultimately biodiversity is the source of all crops and domestic animals, through its role as the raw material in plant and animal breeding, and new and higher-yielding plant and animal varieties are generated from the natural variation in plants and animals. The great increases in grain yields of the "green revolution" of the 1960s and 1970s, which were responsible for keeping food output growing in parallel with population in developing countries, were largely achieved by use of the genetic diversity of plant populations. Specifically, in the last half century we have seen a doubling in yields of rice, barley, soybeans, wheat, cotton, and sugarcane, a threefold increase in tomato yields, and a quadrupling in yields of maize, sorghum and potato (National Research Council). All of this has been based on and derived from genetic variability in the underlying plant populations. In economic terms, this variability is an asset, and one that has yielded a great return at little cost.

Insurance against attack by pathogens has been one of the most important contributions of biodiversity. An example that illustrates well the issue here is the role of biodiversity in preserving the Asian rice crop in the face of a new virus, the grassy stunt virus, carried by the brown plant hopper. This appeared capable of destroying a large fraction of the crop and in some years destroyed as much as one quarter. Rice breeders developed a form of rice resistant to this with the help of the International Rice Research Institute (IRRI) in the Philippines, which conducts research on rice production, and holds a large seed bank of seeds of tens of thousands of different varieties of rice and the near-relatives of rice. In this case the IRRI located a strain of wild rice not used commercially but resistant to the grassy stunt virus. The gene conveying resistance was transferred to commercial rice

varieties, yielding commercial rice resistant to the threatening virus. This would not have been possible without genes from a strain of rice apparently of no commercial value. The same story was repeated later in the 1970s, and similar stories have occurred with other food crops, in particular corn in the United States (Myers). We have every reason to expect that events like these will recur regularly: planting large areas with genetically identical plants greatly increases the chances that once a disease starts it will spread with dangerous speed through the entire area and crop.

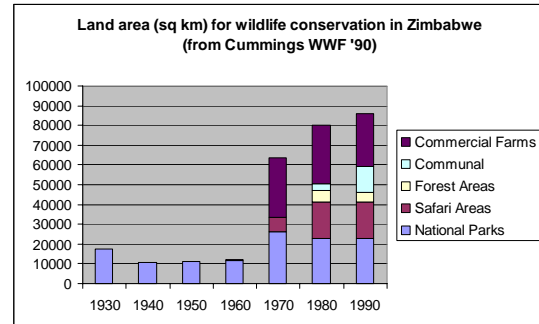
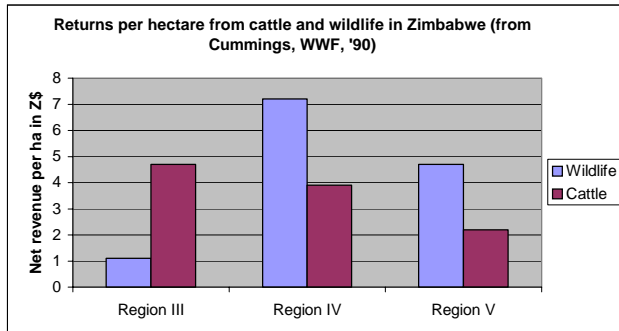
The third reason I gave above for the importance of biodiversity, is that it is a source of knowledge. We can learn from natural organisms how to make chemicals that have important and valuable properties. A good example is provided by the polymerase chain reaction (PCR). This reaction is central to the amplification of DNA specimens for analysis – as in forensic tests used in trials, and in many processes central to the biotechnology industry. Culturing requires an enzyme that is resistant to high temperatures. Enzymes with the right degree of temperature resistance were found in hot springs in Yellowstone National Park, and the heat resistance of these was then used to create an enzyme that could be used to culture DNA specimens. This enzyme is now central to the rapidly growing biotechnology industry. There are many less complex examples. In fact 37% by value of the pharmaceuticals sold in the United States are or were originally derived from plants or other living organisms (Carte). Aspirin comes from the bark of willow trees. The bark of Yew trees has been used to derive a drug that is effective against ovarian cancer. A derivative of the Rosy Periwinkle flower is being used to cure childhood leukemia. The key point is that certain plants and animals are known to produce substances that are highly active pharmacologically. Plants that live in insect-infested areas produce substances that are poisonous to insects, and these have been used as the basis for insecticides. Some snakes produce venom that paralyses parts of the nervous system, and others produce venom that reduces blood pressure. Other insects produce anti-coagulants. All of these have been adapted for medical use.

Markets and biodiversity

Given the undoubted economic value of biodiversity, it is natural to ask whether some of this value can be captured by markets. If it could, then this captured value would provide

a conservation incentive: some of the services of biodiversity could be sold by those who conserve it and would give a return on conservation. To some degree this is possible and is even happening, but the realization of its full potential requires further development of global markets – requires, that is, further globalization. Good examples of this point are provided by ecotourism, by emerging markets for carbon sequestration, and by the beginnings of a movement that merges conservation with development.

Ecotourism is emerging as a powerful force for combining economic development with environmental conservation in a number of poor countries, particularly in Africa and Latin America. Tourism is one of the world's largest industries, being according to several estimates the largest source of employment in the world and also the fastest-growing. Within this whole, one of the fastest-growing subsectors is ecotourism, tourism based on the desire to see and experience some of the world's most unique ecosystems. Within the industrial world there is a substantial willingness to pay for experiencing these ecosystems, and this translates into a high return to their conservation if this is accompanied by successful marketing in rich countries. Figure 1, based on data from Zimbabwe, illustrates this point. For three of the five ecological regions into which the country is divided (the three which cover the great majority of the country), it shows the returns to two different forms of land use, cattle ranching and game ranching. Cattle ranching is the traditional form of agriculture here, and destroys the native flora and fauna. Game ranching is the term used for reestablishing the original ecosystems and then charging tourists for viewing the animals that are a part of these. This usually involves some initial expenses, restocking the land with the native fauna and fencing it to prevent them from moving away. As the figure shows, for two of the three regions the revenue per hectare per year is greater from game ranching than from cattle ranching, and indeed for all three regions the return on capital is greater from game ranching. Environmental conservation or restoration is competitive with cattle ranching, and because of this we see in figure 2 that the land area devoted to wildlife conservation has increased dramatically over the last thirty years. Similar stories can be told for other African countries, and indeed for some regions in Central and South America. The growth of ecotourism in southern Africa has been so extensive that about eighteen percent of the land area is now given over to wildlife support.



The connection with globalization here is immediate: the great majority of the tourists whose spending supports game ranching are from the US and Western Europe. Only since the development of a truly global tourist industry has this business taken off. For tourism to both provide goods returns to the local population and be sufficiently low-impact to avoid adverse environmental impacts, it has to be low-density and high price, which means that most of the visitors must be from rich countries. So the existence of global markets is a prerequisite for tourism to support environmental conservation.

Markets for carbon sequestration have the potential to modify greatly the incentives for the conservation of forests, which are home to much of the planet's biodiversity. From an economic perspective the big problem with forest conservation is that the benefits of conservation accrue to people who do not pay the costs, and in particular very few of the benefits of conservation ever reach those who have to pay for it. This is a classic example of external effects and of course results in under-conservation relative to what is needed for efficiency. The benefits of forest conservation include biodiversity support, carbon sequestration and in many cases watershed conservation. In the first two cases – biodiversity and carbon sequestration – the benefits are global. Everyone on the planet benefits from the reduction of greenhouse gases and from the conservation of biodiversity. In the third case, watershed conservation, the benefits accrue to those who live downstream. In no case do the forest owners, who pay for conservation, receive the returns. The only returns that they can usually obtain are from logging, which in general

involves destroying the forest. To avoid this mismatch between costs and benefits we need to find ways of bringing returns from conservation home to the owners.

Bioprospecting is in principle one way of doing this, though there is some uncertainty about the yields from this (Simpson Sedjo and Reid; Rausser and Small). Another route lies via payment for carbon sequestration. This is possible under the Clean Development Mechanism (CDM) of the Kyoto Protocol, and rough calculations suggest that payments for carbon sequestration could be in excess of the returns from logging followed by cattle ranching (Heal 2000). If this were true, and this provision were implemented, then this would radically change the incentives for the conservation of forests, especially moist tropical forests. Again, a prerequisite for this is the development of global markets for carbon sequestration, through which willingness to pay for climate stabilization could be channeled to developing countries with forests.

Global markets and public goods

Many of the services provided by biodiversity are public goods. Its contributions to productivity, to insurance against pathogen attack and to the accumulation of knowledge are all essentially public in nature in that they are non-rival in consumption. It is counterintuitive that we should be seeking to use global markets, or indeed any markets, to ensure the adequate provision of public goods. After all, we know that markets will typically under provide public goods. In fact the examples discussed, tourism and carbon sequestration, illustrate situations where markets do have real potential for managing the provision of public goods. Incentives for carbon sequestration under the CDM of the Kyoto Protocol are a by-product of a cap and trade regime for greenhouse gases, which is central to the cost-minimization provisions of the Protocol. Cap and trade mechanisms are increasingly being used to manage the provision of public goods, particularly those that are privately produced (Heal and Lin). In this case a public bad, greenhouse gas, is produced by every individual and firm on the planet, and only decentralized mechanisms have the potential to provide incentives for reducing this production. This is where cap and trade systems match the problem well.

In the case of tourism, the connection between public goods and markets is less clear. What is happening in this case is that public and private goods are being bundled. The

reason is that public goods can affect willingness to pay for private goods. We have long known that local public goods affect property values. Schools are the canonical example: house prices reflect access to good public schools. This is also true for environmental public goods. Recent econometric studies (Sieg Smith Banzhaf and Walsh, Chay and Greenstone) indicate that house prices are positively affected by local environmental quality. Lately some property developers, seemingly aware of this, have deliberately conserved environmental assets and provided local public goods as a part of profit-maximizing development strategies.

Two examples capture well the key issue. Spring Island off the coast of South Carolina has long been highly valued as a nature reserve. Zoned for development, it was auctioned in 1990. The State of South Carolina bid, hoping to purchase the land for conservation, but was outbid by a developer. The latter, instead of constructing the 5,500 homes permitted, built only 500 high-value properties and deeded the balance of the land to a land management trust whose objective is to conserve the natural environment. He subsequently explained that this was his most profitable strategy. Proximity to a nature reserve boosted buyers' willingness-to-pay, so that limiting development in this way raised the value of the homes sufficiently to compensate for the reduced number. (The tax deduction on the donation to a conservation foundation also helped.) (Thacker) A similar story relates to hunters in Montana, who had long hunted over many thousands of acres of unspoiled land. Concerned that second home development might end their hunting, they borrowed money to buy the land and finance the construction of a small number of luxury homes. The hunters placed a conservation easement on the remainder of the land, reserving the right to hunt on it themselves, and sold the houses for more than the total cost of buying the land and building the houses (Heal 2000).

What do these examples suggest? Clearly proximity to a unique and beautiful environmental site (a public good) enhances property values, and some developers believe that this is sufficient to justify conserving such sites even when developing them is an option. In other words, the conflict between development and conservation may not be as sharp as generally thought: there may be cases in which the most profitable development requires some measure of conservation. To put this in more economic terms, bundling an environmental public good with homes may be a profitable strategy.

An interesting recent study by Taylor and Smith confirms more generally that access to environmental amenities can be a source of market power and product differentiation. In fact this point is now widely known: developers and urban planners now refer to this strategy as smart growth. An early illustration emerges from the history of New York's Central Park. When the designer Frederick Law Olmsted was asked how the City could pay for the park, he responded that its presence would raise property values and the extra tax revenues would easily repay the construction costs. History shows that was correct. (Lerner and Poole)

These observations naturally prompt us to examine in more detail the incentives for bundling environmental public goods with private goods. It would be interesting if there were conditions under which a profit-maximizing supplier of a private good would provide an associated public good at the economically optimal level. Given our normal scepticism about the ability of markets to provide public goods optimally, this appears at first sight an unlikely outcome. But I show in (Heal 2001) that there are in fact reasonable and robust conditions under which this occurs. When viewed from the appropriate perspective, this result is intuitive.

The precise result proven is the following. A price discriminating monopolist provides a private good and can also provide a public good. The latter can be bundled with the former, affecting buyers' willingness to pay for the private good. Then the monopolist will provide the public good at its economically efficient level. I also establish various generalizations of this: the central feature of the argument is not the public nature of the good bundled with the private good but the fact that there is no market for it. The same result holds when we replace public goods by untraded goods.

This result has some connections to earlier results on price discrimination in markets with private goods and increasing returns. There is also a close connection with the literature on the provision of local public goods in competing jurisdictions, especially with a result due to Scotchmer. There are also references in recent literature to the bundling of public and private goods - both Holm-Muller and Henderson and Thisse address this issue.

Although this research was motivated initially by environmental examples, the results are more general. There are many examples of sellers bundling public or other non-traded

goods with private goods. Security is often bundled with other products, as in gated communities: the security of the community is a local public good that contributes to the value that its inhabitants place on the private goods it contains, houses.² And in a post 9/11 world all airlines are to some degree bundling security with transportation. Going further afield, Reuters and other securities information sellers have long realized that information, being non-rival in consumption, has some of the aspects of a public good, and have relied in their business models on bundling it with private goods such as analytical capabilities and access to proprietary networks. One reason for the greater profitability of AOL relative to other Web portals has been their bundling the private good internet access (as an ISP) with the information gateway function of a portal. Returning to the environmental area, another illustration is the activity of the Forest Stewardship Council (FSC).³ FSC certifies tropical hardwoods as having been sustainably logged. Many timber retailers and furniture makers now sell only imported hardwoods certified by the FSC. Their customers are willing to pay extra for this type of wood. When purchasing certified timber, customers are again buying two commodities - the timber itself and also the preservation of tropical forests, a public good.

Bundling public and private goods

Next I summarize a formal model that justifies the statements made above about bundling public and private goods. The full development of this model can be found in (Heal 2001). We assume that a developer owns the exclusive right to develop a site that is an environmental asset valued by local population. Maximum development of this will destroy its environmental value totally, but is permitted by current zoning regulations. More development means more houses but less of the environmental public good, which may affect population's willingness to pay for houses. The developer has to find the most profitable tradeoff here. House buyer's preferences are represented by $u_i(y_i, h_i, e)$, where y_i is i 's income or wealth, h_i is the level of housing consumed by i in the area to be developed and e , a local public good, is the quantity of a local environmental asset

² We could also think of this as a club. However in general clubs do not operate by bundling public and private goods but by collectively providing an excludable public good. Many of the bundling examples cited below can clearly not be interpreted as clubs.

³ <http://www.fscoax.org/principal.htm>

preserved. We assume that u_i is strictly concave and that buyers have initial endowments given by $(y_{i,0}, h_{i,0}, e_0)$. As a result of development of the area the amounts of housing and public good change to $(h_{i,0} + \Delta h_i, e_0 + \Delta e)$.

Define agent i 's willingness to pay for a change as the value w_i that solves

$$u_i(y_{i,0}, h_{i,0}, e_0) = u_i(y_{i,0} - w_i, h_{i,0} + \Delta h_i, e_0 + \Delta e)$$

The problem facing the developer is to choose levels of housing development Δh_i and conservation Δe so as to maximize profits, which are given by

$$\max \sum w_i - c(\Delta h_1, \dots, \Delta h_N, \Delta e)$$

where $c()$ is the cost of development and conservation. It is now straightforward to prove:

Proposition: *If utility functions are strictly concave and the cost function strictly convex, a profit-maximizing developer who has exclusive development rights and can practice first order price discrimination will provide an economically efficient combination of the private goods involved in housing and the public goods involved in environmental conservation.*

In Heal 2001 this basic model is extended in several ways. One extension is to discrete choices, describing situations where the public good is either provided or not provided. An area is either conserved or not – there are no intermediate possibilities. This is relevant to the ecotourism cases mentioned above: in Africa one can either ranch cattle or restore the original animal populations. But as lions and leopard will eat cattle, combinations are not readily possible. In this case the same results carry over: the profit maximizing outcome is efficient.

Another extension is to the important case of imperfect ability to extract the willingness-to-pay for conservation of the environmental asset. Again this is important in the case of ecotourism, as tourist sites in Africa can only capture the willingness-to-pay of those who actually travel there. There are surely many others who are willing to pay for conservation but who will never actually visit southern Africa. In this case I show in Heal 2001 that for discrete conservation projects there is a fraction f , $0 < f < 1$, such that if developer can extract more than fraction f of willingness-to-pay then the profit-maximizing outcome is efficient.

Globalization and the environment

I have argued above that globalization, of a specific type, has the potential to help the conservation of biodiversity. Are there other relationships between globalization and the environment? There have been suggestions that globalization will provide corporations with the opportunity to avoid environmental regulations by moving to countries with low environmental standards. The idea here is that meeting the environmental standards of the US or the European Union is costly and places companies at a disadvantage relative to their competitors located in countries without such standards. Conceptually this is clearly possible: whether it matters is an empirical question. The evidence available to date suggests that it does not (Eskeland and Harrison). This is perhaps not surprising: as Harrison and note, the costs of environmental compliance are usually a small part of a plant's total costs and rarely sufficient to justify relocation to a different country. Even if it were the case that corporations relocate to take advantage of lower environmental standards, it is not clear that this would affect the conservation of biodiversity: this is a rather different problem from pollution control, which is what is at issue in the arguments about footloose industries.

It is also possible that globalization leads to incentives to clear land for agricultural production for export, and through this mechanism accelerates deforestation and the loss of biodiversity. Opening up overseas markets for timber may also accelerate deforestation for timber. My impression is that at least currently most forest clearing for food production is for domestic consumption rather than for export, although this was probably not always true. It is hard to find firm number on this issue. But opening up export markets undoubtedly has contributed to logging and so to deforestation, and this is an aspect of global trade that we need to address. Mechanisms such as the Forest Stewardship Council mentioned above are a part of the solution, though are not on their own sufficient to provide a solution. Recently there have been moves to have some of the trees most threatened by logging declared as endangered species and brought within the scope of CITES, the Convention on International Trade in Endangered Species. This could also be a move in the right direction, but again is at best a partial solution. Non-endangered trees may support endangered animals. Ultimately the solution lies in more not less globalization, but perhaps of a different type – in the development of the

mechanisms discussed earlier for transferring willingness-to-pay for conservation from rich to poor countries. Then there would be adequate returns to the conservation of forests.

Conclusions

Biodiversity loss is a global problem, and needs global solutions. It is not caused by the globalization of trade and capital markets, but by the growth of the world's population and by the desire for higher standards of living, particularly with respect to food consumption. The solution must involve internalizing some of the external effects associated with biodiversity conservation, and these external effects are often global in scope. Another way of looking at the same phenomenon is as channeling some of the willingness-to-pay for conservation of the rich countries to the poor countries. Ecotourism and markets for carbon sequestration are two very different mechanisms for doing this, but we need more. The fact that many of the services of biodiversity are public in nature does not necessarily rule out the use of market mechanisms for its support.

References

- Carte, B.K. (1996) "The Biomedical Potential of Marine Natural Products" *BioScience*, Vol 46 (#4) pages 271-286 (April).
- Chay, Kenneth and Michael Greenstone. (2000) "Does Air Quality Matter? Evidence from the Housing Market," Revised December 2000 <http://elsa.berkeley.edu/~kenchay>
- Cumming D.H.M. "Developments in game ranching and wildlife utilization in East and Southern Africa" WWF Multispecies Animal Production Systems Project, Project paper no. 13, June 1990. WWF program Office, Zimbabwe, P O Box CY 1409, Causeway, Harare, Zimbabwe.
- Cumming D.H.M. "Wildlife and the market place: A view from Southern Africa" WWF Multispecies Animal Production Systems Project, Project paper no. 12, June 1990. WWF program Office, Zimbabwe, P O Box CY 1409, Causeway, Harare, Zimbabwe.
- Cumming D.H.M. and I. Bond. "Animal production in Southern Africa: present practices and opportunities for peasant farmers in arid lands." WWF Multispecies Animal Production Systems Project, Project paper no. 22, July 1991. WWF program Office, Zimbabwe, P O Box CY 1409, Causeway, Harare, Zimbabwe.
- Eskeland G.A. and A. E. Harrison "Moving to greener pastures: multinationals and the pollution haven hypothesis" NBER Working Paper 8888 April 2002 <http://papers.nber.org/papers/W8888>

- Grime J.P. "Biodiversity and Ecosystem Function: The Debate Deepens." *Science* 277 page 1260 (1977).
- Heal Geoffrey. "Bundling Public and Private Goods." Columbia Business School Working Paper, 2001. www.gsb.columbia.edu/faculty/gheal
- Heal Geoffrey. *Nature and the Marketplace*. Island Press, Washington DC, 2000.
- Heal Geoffrey and Yun Lin. "Strategic behavior in permit markets" in *Environmental Markets* Columbia University Press 2000 (G.M. Heal ed).
- Henderson J. Vernon and Jaques-Francoise Thisse. "On the Pricing Strategy of a Land Developer" *Journal of Urban Economics* 45, 1999, 1-16.
- Holger Sieg, V. Kerry Smith, H. Spencer Banzhaf, Randy Walsh. "Estimating the General Equilibrium Benefits of Large Policy Changes: The Clean Air Act Revisited" <http://papers.nber.org/papers/W7744>
- Holm-Muller, Karin. "Finanzierung von Naturschutz Uber Komplementarguter." *Konjunkturpolitik, Zeitschrift fur angewandte Wirtschaftsforschung*, 45, 1999, Heft 1, 24-39.
- Hooper D.U. and P.M. Vitousek. "The Effect of Plant Composition and Diversity on Ecosystem Processes." *Science* 277 pages 1302-1305 (1997).
- Lerner Steve and William Poole. "The Economic Benefits of Parks and Open Spaces". The Trust for Public Lands, 1999. (See www.tpl.org)
- Myers, N. "Biodiversity's Genetic Library", chapter 14 of G.C. Daily *Nature's Services: Societal Dependence on Natural Ecosystems*. Island Press, 1997, Washington D.C.
- National Research Council, *A Framework for Managing Biodiversity, Report of the Committee on the Economic and Non-Economic Value of Biodiversity*. Washington DC, 1999.
- Rausser G.C. and A.A. Small, "Valuing Research Leads: Bioprospecting and the Conservation of Genetic Resources", paper presented at the Conference on Managing Human-Dominated Ecosystems at the Missouri Botanical Gardens, March 1998. *Journal of Political Economy*.
- Scotchmer Suzanne. "Public Gods and the Invisible Hand" in John Quigley and Eugene Smolensky (eds) *Modern Public Finance*, Harvard University Press 1994.
- Simpson R. D., R. A. Sedjo and J.W. Reid. "Valuing biodiversity for use in pharmaceutical research" *Journal of Political Economy* 1996 104: 163-185
- Taylor Laura O. and V. Kerry Smith. "Environmental Amenities as a Source of Market Power" *Land Economics* November 2000 76(4) 550-568
- Thacker Paul. "Spring Island Developers Go Green." Environmental News Network. www.enm.com/features/2000/06/06012000/island_11964.asp
- Tilman D., J. Knops, D. Wedin, P. Reich, M. Ritchie and E. Siemann. "The Influence of Functional Diversity and Composition on Ecosystem Processes" *Science* 277 pages 1300-1305 (1997).

Walker, B., A.P. Kinzig, & J. Langridge. 1999. Plant attribute diversity, resilience, and ecosystem function: the nature and significance of dominant and minor species. *Ecosystems* 2(2)

NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI

Fondazione Eni Enrico Mattei Working Papers Series

Our working papers are available on the Internet at the following addresses:

Server WWW: WWW.FEEM.IT

Anonymous FTP: FTP.FEEM.IT

http://papers.ssrn.com/abstract_id=XXXXXX

SUST	1.2001	<i>Inge MAYERES and Stef PROOST: <u>Should Diesel Cars in Europe be Discouraged?</u></i>
SUST	2.2001	<i>Paola DORIA and Davide PETTENELLA: <u>The Decision Making Process in Defining and Protecting Critical Natural Capital</u></i>
CLIM	3.2001	<i>Alberto PENCH: <u>Green Tax Reforms in a Computable General Equilibrium Model for Italy</u></i>
CLIM	4.2001	<i>Maurizio BUSSOLO and Dino PINELLI: <u>Green Taxes: Environment, Employment and Growth</u></i>
CLIM	5.2001	<i>Marco STAMPINI: <u>Tax Reforms and Environmental Policies for Italy</u></i>
ETA	6.2001	<i>Walid OUESLATI: <u>Environmental Fiscal Policy in an Endogenous Growth Model with Human Capital</u></i>
CLIM	7.2001	<i>Umberto CIORBA, Alessandro LANZA and Francesco PAULI: <u>Kyoto Commitment and Emission Trading: a European Union Perspective</u></i>
MGMT	8.2001	<i>Brian SLACK (xlv): <u>Globalisation in Maritime Transportation: Competition, uncertainty and implications for port development strategy</u></i>
VOL	9.2001	<i>Giulia PESARO: <u>Environmental Voluntary Agreements: A New Model of Co-operation Between Public and Economic Actors</u></i>
VOL	10.2001	<i>Cathrine HAGEM: <u>Climate Policy, Asymmetric Information and Firm Survival</u></i>
ETA	11.2001	<i>Sergio CURRARINI and Marco MARINI: <u>A Sequential Approach to the Characteristic Function and the Core in Games with Externalities</u></i>
ETA	12.2001	<i>Gaetano BLOISE, Sergio CURRARINI and Nicholas KIKIDIS: <u>Inflation and Welfare in an OLG Economy with a Privately Provided Public Good</u></i>
KNOW	13.2001	<i>Paolo SURICO: <u>Globalisation and Trade: A “New Economic Geography” Perspective</u></i>
ETA	14.2001	<i>Valentina BOSETTI and Vincenzina MESSINA: <u>Quasi Option Value and Irreversible Choices</u></i>
CLIM	15.2001	<i>Guy ENGELEN (xlii): <u>Desertification and Land Degradation in Mediterranean Areas: from Science to Integrated Policy Making</u></i>
SUST	16.2001	<i>Julie Catherine SORS: <u>Measuring Progress Towards Sustainable Development in Venice: A Comparative Assessment of Methods and Approaches</u></i>
SUST	17.2001	<i>Julie Catherine SORS: <u>Public Participation in Local Agenda 21: A Review of Traditional and Innovative Tools</u></i>
CLIM	18.2001	<i>Johan ALBRECHT and Niko GOBBIN: <u>Schumpeter and the Rise of Modern Environmentalism</u></i>
VOL	19.2001	<i>Rinaldo BRAU, Carlo CARRARO and Giulio GOLFETTO (xliii): <u>Participation Incentives and the Design of Voluntary Agreements</u></i>
ETA	20.2001	<i>Paola ROTA: <u>Dynamic Labour Demand with Lumpy and Kinked Adjustment Costs</u></i>
ETA	21.2001	<i>Paola ROTA: <u>Empirical Representation of Firms’ Employment Decisions by an (S,s) Rule</u></i>
ETA	22.2001	<i>Paola ROTA: <u>What Do We Gain by Being Discrete? An Introduction to the Econometrics of Discrete Decision Processes</u></i>
PRIV	23.2001	<i>Stefano BOSI, Guillaume GIRMANS and Michel GUILLARD: <u>Optimal Privatisation Design and Financial Markets</u></i>
KNOW	24.2001	<i>Giorgio BRUNELLO, Claudio LUPI, Patrizia ORDINE, and Maria Luisa PARISI: <u>Beyond National Institutions: Labour Taxes and Regional Unemployment in Italy</u></i>
ETA	25.2001	<i>Klaus CONRAD: <u>Locational Competition under Environmental Regulation when Input Prices and Productivity Differ</u></i>
PRIV	26.2001	<i>Bernardo BORTOLOTTI, Juliet D’SOUZA, Marcella FANTINI and William L. MEGGINSON: <u>Sources of Performance Improvement in Privatised Firms: A Clinical Study of the Global Telecommunications Industry</u></i>
CLIM	27.2001	<i>Frédéric BROCHIER and Emiliano RAMIERI: <u>Climate Change Impacts on the Mediterranean Coastal Zones</u></i>
ETA	28.2001	<i>Nunzio CAPPUCCIO and Michele MORETTO: <u>Comments on the Investment-Uncertainty Relationship in a Real Option Model</u></i>
KNOW	29.2001	<i>Giorgio BRUNELLO: <u>Absolute Risk Aversion and the Returns to Education</u></i>
CLIM	30.2001	<i>ZhongXiang ZHANG: <u>Meeting the Kyoto Targets: The Importance of Developing Country Participation</u></i>
ETA	31.2001	<i>Jonathan D. KAPLAN, Richard E. HOWITT and Y. Hossein FARZIN: <u>An Information-Theoretical Analysis of Budget-Constrained Nonpoint Source Pollution Control</u></i>
MGMT Coalition	32.2001	<i>Roberta SALOMONE and Giulia GALLUCCIO: <u>Environmental Issues and Financial Reporting Trends</u></i>
Theory Network	33.2001	<i>Shlomo WEBER and Hans WIESMETH: <u>From Autarky to Free Trade: The Impact on Environment</u></i>
ETA	34.2001	<i>Margarita GENIUS and Elisabetta STRAZZERA: <u>Model Selection and Tests for Non Nested Contingent Valuation Models: An Assessment of Methods</u></i>

NRM	35.2001	<i>Carlo GIUPPONI</i> : <u>The Substitution of Hazardous Molecules in Production Processes: The Atrazine Case Study in Italian Agriculture</u>
KNOW	36.2001	<i>Raffaele PACI and Francesco PIGLIARU</i> : <u>Technological Diffusion, Spatial Spillovers and Regional Convergence in Europe</u>
PRIV	37.2001	<i>Bernardo BORTOLOTTI</i> : <u>Privatisation, Large Shareholders, and Sequential Auctions of Shares</u>
CLIM	38.2001	<i>Barbara BUCHNER</i> : <u>What Really Happened in The Hague? Report on the COP6, Part I, 13-25 November 2000, The Hague, The Netherlands</u>
PRIV	39.2001	<i>Giacomo CALZOLARI and Carlo SCARPA</i> : <u>Regulation at Home, Competition Abroad: A Theoretical Framework</u>
KNOW	40.2001	<i>Giorgio BRUNELLO</i> : <u>On the Complementarity between Education and Training in Europe</u>
Coalition Theory Network	41.2001	<i>Alain DESDOIGTS and Fabien MOIZEAU</i> (xlvi): <u>Multiple Politico-Economic Regimes, Inequality and Growth</u>
Coalition Theory Network	42.2001	<i>Parkash CHANDER and Henry TULKENS</i> (xlvi): <u>Limits to Climate Change</u>
Coalition Theory Network	43.2001	<i>Michael FINUS and Bianca RUNDSHAGEN</i> (xlvi): <u>Endogenous Coalition Formation in Global Pollution Control</u>
Coalition Theory Network	44.2001	<i>Wietze LISE, Richard S.J. TOL and Bob van der ZWAAN</i> (xlvi): <u>Negotiating Climate Change as a Social Situation</u>
NRM	45.2001	<i>Mohamad R. KHAWLIE</i> (xlvi): <u>The Impacts of Climate Change on Water Resources of Lebanon- Eastern Mediterranean</u>
NRM	46.2001	<i>Mutasem EL-FADEL and E. BOU-ZEID</i> (xlvi): <u>Climate Change and Water Resources in the Middle East: Vulnerability, Socio-Economic Impacts and Adaptation</u>
NRM	47.2001	<i>Eva IGLESIAS, Alberto GARRIDO and Almudena GOMEZ</i> (xlvi): <u>An Economic Drought Management Index to Evaluate Water Institutions' Performance Under Uncertainty and Climate Change</u>
CLIM	48.2001	<i>Wietze LISE and Richard S.J. TOL</i> (xlvi): <u>Impact of Climate on Tourist Demand</u>
CLIM	49.2001	<i>Francesco BOSELLO, Barbara BUCHNER, Carlo CARRARO and Davide RAGGI</i> : <u>Can Equity Enhance Efficiency? Lessons from the Kyoto Protocol</u>
SUST	50.2001	<i>Roberto ROSON</i> (xlvi): <u>Carbon Leakage in a Small Open Economy with Capital Mobility</u>
SUST	51.2001	<i>Edwin WOERDMAN</i> (xlvi): <u>Developing a European Carbon Trading Market: Will Permit Allocation Distort Competition and Lead to State Aid?</u>
SUST	52.2001	<i>Richard N. COOPER</i> (xlvi): <u>The Kyoto Protocol: A Flawed Concept</u>
SUST	53.2001	<i>Kari KANGAS</i> (xlvi): <u>Trade Liberalisation, Changing Forest Management and Roundwood Trade in Europe</u>
SUST	54.2001	<i>Xueqin ZHU and Ekko VAN IERLAND</i> (xlvi): <u>Effects of the Enlargement of EU on Trade and the Environment</u>
SUST	55.2001	<i>M. Ozgur KAYALICA and Sajal LAHIRI</i> (xlvi): <u>Strategic Environmental Policies in the Presence of Foreign Direct Investment</u>
SUST	56.2001	<i>Savas ALPAY</i> (xlvi): <u>Can Environmental Regulations be Compatible with Higher International Competitiveness? Some New Theoretical Insights</u>
SUST	57.2001	<i>Roldan MURADIAN, Martin O'CONNOR, Joan MARTINEZ-ALER</i> (xlvi): <u>Embodied Pollution in Trade: Estimating the "Environmental Load Displacement" of Industrialised Countries</u>
SUST	58.2001	<i>Matthew R. AUER and Rafael REUVENY</i> (xlvi): <u>Foreign Aid and Direct Investment: Key Players in the Environmental Restoration of Central and Eastern Europe</u>
SUST	59.2001	<i>Onno J. KUIK and Frans H. OOSTERHUIS</i> (xlvi): <u>Lessons from the Southern Enlargement of the EU for the Environmental Dimensions of Eastern Enlargement, in particular for Poland</u>
ETA	60.2001	<i>Carlo CARRARO, Alessandra POME and Domenico SINISCALCO</i> (xlix): <u>Science vs. Profit in Research: Lessons from the Human Genome Project</u>
CLIM	61.2001	<i>Efrem CASTELNUOVO, Michele MORETTO and Sergio VERGALLI</i> : <u>Global Warming, Uncertainty and Endogenous Technical Change: Implications for Kyoto</u>
PRIV	62.2001	<i>Gian Luigi ALBANO, Fabrizio GERMANO and Stefano LOVO</i> : <u>On Some Collusive and Signaling Equilibria in Ascending Auctions for Multiple Objects</u>
CLIM	63.2001	<i>Elbert DIJKGRAAF and Herman R.J. VOLLEBERGH</i> : <u>A Note on Testing for Environmental Kuznets Curves with Panel Data</u>
CLIM	64.2001	<i>Paolo BUONANNO, Carlo CARRARO and Marzio GALEOTTI</i> : <u>Endogenous Induced Technical Change and the Costs of Kyoto</u>
CLIM	65.2001	<i>Guido CAZZAVILLAN and Ignazio MUSU</i> (l): <u>Transitional Dynamics and Uniqueness of the Balanced-Growth Path in a Simple Model of Endogenous Growth with an Environmental Asset</u>
CLIM	66.2001	<i>Giovanni BAIOCCHI and Salvatore DI FALCO</i> (l): <u>Investigating the Shape of the EKC: A Nonparametric Approach</u>
CLIM	67.2001	<i>Marzio GALEOTTI, Alessandro LANZA and Francesco PAULI</i> (l): <u>Desperately Seeking (Environmental) Kuznets: A New Look at the Evidence</u>
CLIM	68.2001	<i>Alexey VIKHLYAEV</i> (xlvi): <u>The Use of Trade Measures for Environmental Purposes – Globally and in the EU Context</u>
NRM	69.2001	<i>Gary D. LIBECAP and Zeynep K. HANSEN</i> (li): <u>U.S. Land Policy, Property Rights, and the Dust Bowl of the 1930s</u>

NRM	70.2001	<i>Lee J. ALSTON, Gary D. LIBECAP and Bernardo MUELLER</i> (li): <u>Land Reform Policies. The Sources of Violent Conflict and Implications for Deforestation in the Brazilian Amazon</u>
CLIM	71.2001	<i>Claudia KEMFERT</i> : <u>Economy-Energy-Climate Interaction – The Model WIAGEM -</u>
SUST	72.2001	<i>Paulo A.L.D. NUNES and Yohanes E. RIYANTO</i> : <u>Policy Instruments for Creating Markets for Biodiversity: Certification and Ecolabeling</u>
SUST	73.2001	<i>Paulo A.L.D. NUNES and Erik SCHOKKAERT</i> (lii): <u>Warm Glow and Embedding in Contingent Valuation</u>
SUST	74.2001	<i>Paulo A.L.D. NUNES, Jeroen C.J.M. van den BERGH and Peter NIJKAMP</i> (lii): <u>Ecological-Economic Analysis and Valuation of Biodiversity</u>
VOL	75.2001	<i>Johan EYCKMANS and Henry TULKENS</i> (li): <u>Simulating Coalitionally Stable Burden Sharing Agreements for the Climate Change Problem</u>
PRIV	76.2001	<i>Axel GAUTIER and Florian HEIDER</i> : <u>What Do Internal Capital Markets Do? Redistribution vs. Incentives</u>
PRIV	77.2001	<i>Bernardo BORTOLOTTI, Marcella FANTINI and Domenico SINISCALCO</i> : <u>Privatisation around the World: New Evidence from Panel Data</u>
ETA	78.2001	<i>Toke S. AIDT and Jayasri DUTTA</i> (li): <u>Transitional Politics. Emerging Incentive-based Instruments in Environmental Regulation</u>
ETA	79.2001	<i>Alberto PETRUCCI</i> : <u>Consumption Taxation and Endogenous Growth in a Model with New Generations</u>
ETA	80.2001	<i>Pierre LASSERRE and Antoine SOUBEYRAN</i> (li): <u>A Ricardian Model of the Tragedy of the Commons</u>
ETA	81.2001	<i>Pierre COURTOIS, Jean Christophe PÉREAU and Tarik TAZDAÏT</i> : <u>An Evolutionary Approach to the Climate Change Negotiation Game</u>
NRM	82.2001	<i>Christophe BONTEMPS, Stéphane COUTURE and Pascal FAVARD</i> : <u>Is the Irrigation Water Demand Really Convex?</u>
NRM	83.2001	<i>Unai PASCUAL and Edward BARBIER</i> : <u>A Model of Optimal Labour and Soil Use with Shifting Cultivation</u>
CLIM	84.2001	<i>Jesper JENSEN and Martin Hvidt THELLE</i> : <u>What are the Gains from a Multi-Gas Strategy?</u>
CLIM	85.2001	<i>Maurizio MICHELINI</i> (liii): IPCC “Summary for Policymakers” in TAR. <u>Do its results give a scientific support always adequate to the urgencies of Kyoto negotiations?</u>
CLIM	86.2001	<i>Claudia KEMFERT</i> (liii): <u>Economic Impact Assessment of Alternative Climate Policy Strategies</u>
CLIM	87.2001	<i>Cesare DOSI and Michele MORETTO</i> : <u>Global Warming and Financial Umbrellas</u>
ETA	88.2001	<i>Elena BONTEMPI, Alessandra DEL BOCA, Alessandra FRANZOSI, Marzio GALEOTTI and Paola ROTA</i> : <u>Capital Heterogeneity: Does it Matter? Fundamental Q and Investment on a Panel of Italian Firms</u>
ETA	89.2001	<i>Efrem CASTELNUOVO and Paolo SURICO</i> : <u>Model Uncertainty, Optimal Monetary Policy and the Preferences of the Fed</u>
CLIM	90.2001	<i>Umberto CIORBA, Alessandro LANZA and Francesco PAULI</i> : <u>Kyoto Protocol and Emission Trading: Does the US Make a Difference?</u>
CLIM	91.2001	<i>ZhongXiang ZHANG and Lucas ASSUNCAO</i> : <u>Domestic Climate Policies and the WTO</u>
SUST	92.2001	<i>Anna ALBERINI, Alan KRUPNICK, Maureen CROPPER, Nathalie SIMON and Joseph COOK</i> (lii): <u>The Willingness to Pay for Mortality Risk Reductions: A Comparison of the United States and Canada</u>
SUST	93.2001	<i>Riccardo SCARPA, Guy D. GARROD and Kenneth G. WILLIS</i> (lii): <u>Valuing Local Public Goods with Advanced Stated Preference Models: Traffic Calming Schemes in Northern England</u>
CLIM	94.2001	<i>Ming CHEN and Larry KARP</i> : <u>Environmental Indices for the Chinese Grain Sector</u>
CLIM	95.2001	<i>Larry KARP and Jiangfeng ZHANG</i> : <u>Controlling a Stock Pollutant with Endogenous Investment and Asymmetric Information</u>
ETA	96.2001	<i>Michele MORETTO and Gianpaolo ROSSINI</i> : <u>On the Opportunity Cost of Nontradable Stock Options</u>
SUST	97.2001	<i>Elisabetta STRAZZERA, Margarita GENIUS, Riccardo SCARPA and George HUTCHINSON</i> : <u>The Effect of Protest Votes on the Estimates of Willingness to Pay for Use Values of Recreational Sites</u>
NRM	98.2001	<i>Frédéric BROCHIER, Carlo GIUPPONI and Alberto LONGO</i> : <u>Integrated Coastal Zone Management in the Venice Area – Perspectives of Development for the Rural Island of Sant’Erasmus</u>
NRM	99.2001	<i>Frédéric BROCHIER, Carlo GIUPPONI and Julie SORS</i> : <u>Integrated Coastal Management in the Venice Area – Potentials of the Integrated Participatory Management Approach</u>
NRM	100.2001	<i>Frédéric BROCHIER and Carlo GIUPPONI</i> : <u>Integrated Coastal Zone Management in the Venice Area – A Methodological Framework</u>
PRIV	101.2001	<i>Enrico C. PEROTTI and Luc LAEVEN</i> : <u>Confidence Building in Emerging Stock Markets</u>
CLIM	102.2001	<i>Barbara BUCHNER, Carlo CARRARO and Igor CERSOSIMO</i> : <u>On the Consequences of the U.S. Withdrawal from the Kyoto/Bonn Protocol</u>
SUST	103.2001	<i>Riccardo SCARPA, Adam DRUCKER, Simon ANDERSON, Nancy FERRAES-EHUAN, Veronica GOMEZ, Carlos R. RISOPATRON and Olga RUBIO-LEONEL</i> : <u>Valuing Animal Genetic Resources in Peasant Economies: The Case of the Box Keken Creole Pig in Yucatan</u>
SUST	104.2001	<i>R. SCARPA, P. KRISTJANSON, A. DRUCKER, M. RADENY, E.S.K. RUTO, and J.E.O. REGE</i> : <u>Valuing Indigenous Cattle Breeds in Kenya: An Empirical Comparison of Stated and Revealed Preference Value Estimates</u>
SUST	105.2001	<i>Clemens B.A. WOLLNY</i> : <u>The Need to Conserve Farm Animal Genetic Resources Through Community-Based Management in Africa: Should Policy Makers be Concerned?</u>
SUST	106.2001	<i>J.T. KARUGIA, O.A. MWAI, R. KAITHO, Adam G. DRUCKER, C.B.A. WOLLNY and J.E.O. REGE</i> : <u>Economic Analysis of Crossbreeding Programmes in Sub-Saharan Africa: A Conceptual Framework and Kenyan Case Study</u>
SUST	107.2001	<i>W. AYALEW, J.M. KING, E. BRUNS and B. RISCHKOWSKY</i> : <u>Economic Evaluation of Smallholder Subsistence Livestock Production: Lessons from an Ethiopian Goat Development Program</u>

SUST	108.2001	<i>Gianni CICIA, Elisabetta D'ERCOLE and Davide MARINO: <u>Valuing Farm Animal Genetic Resources by Means of Contingent Valuation and a Bio-Economic Model: The Case of the Pentro Horse</u></i>
SUST	109.2001	<i>Clem TISDELL: <u>Socioeconomic Causes of Loss of Animal Genetic Diversity: Analysis and Assessment</u></i>
SUST	110.2001	<i>M.A. JABBAR and M.L. DIEDHOU: <u>Does Breed Matter to Cattle Farmers and Buyers? Evidence from West Africa</u></i>
SUST	1.2002	<i>K. TANO, M.D. FAMINOW, M. KAMUANGA and B. SWALLOW: <u>Using Conjoint Analysis to Estimate Farmers' Preferences for Cattle Traits in West Africa</u></i>
ETA	2.2002	<i>Efrem CASTELNUOVO and Paolo SURICO: <u>What Does Monetary Policy Reveal about Central Bank's Preferences?</u></i>
WAT	3.2002	<i>Duncan KNOWLER and Edward BARBIER: <u>The Economics of a "Mixed Blessing" Effect: A Case Study of the Black Sea</u></i>
CLIM	4.2002	<i>Andreas LÖSCHEL: <u>Technological Change in Economic Models of Environmental Policy: A Survey</u></i>
VOL	5.2002	<i>Carlo CARRARO and Carmen MARCHIORI: <u>Stable Coalitions</u></i>
CLIM	6.2002	<i>Marzio GALEOTTI, Alessandro LANZA and Matteo MANERA: <u>Rockets and Feathers Revisited: An International Comparison on European Gasoline Markets</u></i>
ETA	7.2002	<i>Effrosyni DIAMANTOUDI and Eftichios S. SARTZETAKIS: <u>Stable International Environmental Agreements: An Analytical Approach</u></i>
KNOW	8.2002	<i>Alain DESDOIGTS: <u>Neoclassical Convergence Versus Technological Catch-up: A Contribution for Reaching a Consensus</u></i>
NRM	9.2002	<i>Giuseppe DI VITA: <u>Renewable Resources and Waste Recycling</u></i>
KNOW	10.2002	<i>Giorgio BRUNELLO: <u>Is Training More Frequent when Wage Compression is Higher? Evidence from 11 European Countries</u></i>
ETA	11.2002	<i>Mordecai KURZ, Hehui JIN and Maurizio MOTOLESE: <u>Endogenous Fluctuations and the Role of Monetary Policy</u></i>
KNOW	12.2002	<i>Reyer GERLAGH and Marjan W. HOFKES: <u>Escaping Lock-in: The Scope for a Transition towards Sustainable Growth?</u></i>
NRM	13.2002	<i>Michele MORETTO and Paolo ROSATO: <u>The Use of Common Property Resources: A Dynamic Model</u></i>
CLIM	14.2002	<i>Philippe QUIRION: <u>Macroeconomic Effects of an Energy Saving Policy in the Public Sector</u></i>
CLIM	15.2002	<i>Roberto ROSON: <u>Dynamic and Distributional Effects of Environmental Revenue Recycling Schemes: Simulations with a General Equilibrium Model of the Italian Economy</u></i>
CLIM	16.2002	<i>Francesco RICCI (I): <u>Environmental Policy Growth when Inputs are Differentiated in Pollution Intensity</u></i>
ETA	17.2002	<i>Alberto PETRUCCI: <u>Devaluation (Levels versus Rates) and Balance of Payments in a Cash-in-Advance Economy</u></i>
Coalition Theory Network	18.2002	<i>László Á. KÓCZY (liv): <u>The Core in the Presence of Externalities</u></i>
Coalition Theory Network	19.2002	<i>Steven J. BRAMS, Michael A. JONES and D. Marc KILGOUR (liv): <u>Single-Peakedness and Disconnected Coalitions</u></i>
Coalition Theory Network	20.2002	<i>Guillaume HAERINGER (liv): <u>On the Stability of Cooperation Structures</u></i>
NRM	21.2002	<i>Fausto CAVALLARO and Luigi CIRAULO: <u>Economic and Environmental Sustainability: A Dynamic Approach in Insular Systems</u></i>
CLIM	22.2002	<i>Barbara BUCHNER, Carlo CARRARO, Igor CERSOSIMO and Carmen MARCHIORI: <u>Back to Kyoto? US Participation and the Linkage between R&D and Climate Cooperation</u></i>
CLIM	23.2002	<i>Andreas LÖSCHEL and ZhongXIANG ZHANG: <u>The Economic and Environmental Implications of the US Repudiation of the Kyoto Protocol and the Subsequent Deals in Bonn and Marrakech</u></i>
ETA	24.2002	<i>Marzio GALEOTTI, Louis J. MACCINI and Fabio SCHIANTARELLI: <u>Inventories, Employment and Hours</u></i>
CLIM	25.2002	<i>Hannes EGLI: <u>Are Cross-Country Studies of the Environmental Kuznets Curve Misleading? New Evidence from Time Series Data for Germany</u></i>
ETA	26.2002	<i>Adam B. JAFFE, Richard G. NEWELL and Robert N. STAVINS: <u>Environmental Policy and Technological Change</u></i>
SUST	27.2002	<i>Joseph C. COOPER and Giovanni SIGNORELLO: <u>Farmer Premiums for the Voluntary Adoption of Conservation Plans</u></i>
SUST	28.2002	<i><u>The ANSEA Network: Towards An Analytical Strategic Environmental Assessment</u></i>
KNOW	29.2002	<i>Paolo SURICO: <u>Geographic Concentration and Increasing Returns: a Survey of Evidence</u></i>
ETA	30.2002	<i>Robert N. STAVINS: <u>Lessons from the American Experiment with Market-Based Environmental Policies</u></i>
NRM	31.2002	<i>Carlo GIUPPONI and Paolo ROSATO: <u>Multi-Criteria Analysis and Decision-Support for Water Management at the Catchment Scale: An Application to Diffuse Pollution Control in the Venice Lagoon</u></i>
NRM	32.2002	<i>Robert N. STAVINS: <u>National Environmental Policy During the Clinton Years</u></i>
KNOW	33.2002	<i>A. SOUBEYRAN and H. STAHN : <u>Do Investments in Specialized Knowledge Lead to Composite Good Industries?</u></i>
KNOW	34.2002	<i>G. BRUNELLO, M.L. PARISI and Daniela SONEDDA: <u>Labor Taxes, Wage Setting and the Relative Wage Effect</u></i>
CLIM	35.2002	<i>C. BOEMARE and P. QUIRION (lv): <u>Implementing Greenhouse Gas Trading in Europe: Lessons from Economic Theory and International Experiences</u></i>

CLIM	36.2002	<i>T. TIETENBERG</i> (lv): <u>The Tradable Permits Approach to Protecting the Commons: What Have We Learned?</u>
CLIM	37.2002	<i>K. REHDANZ and R.J.S. TOL</i> (lv): <u>On National and International Trade in Greenhouse Gas Emission Permits</u>
CLIM	38.2002	<i>C. FISCHER</i> (lv): <u>Multinational Taxation and International Emissions Trading</u>
SUST	39.2002	<i>G. SIGNORELLO and G. PAPPALARDO</i> : <u>Farm Animal Biodiversity Conservation Activities in Europe under the Framework of Agenda 2000</u>
NRM	40.2002	<i>S.M. CAVANAGH, W. M. HANEMANN and R. N. STAVINS</i> : <u>Muffled Price Signals: Household Water Demand under Increasing-Block Prices</u>
NRM	41.2002	<i>A. J. PLANTINGA, R. N. LUBOWSKI and R. N. STAVINS</i> : <u>The Effects of Potential Land Development on Agricultural Land Prices</u>
CLIM	42.2002	<i>C. OHL</i> (lvi): <u>Inducing Environmental Co-operation by the Design of Emission Permits</u>
CLIM	43.2002	<i>J. EYCKMANS, D. VAN REGEMORTER and V. VAN STEENBERGHE</i> (lvi): <u>Is Kyoto Fatally Flawed? An Analysis with MacGEM</u>
CLIM	44.2002	<i>A. ANTOCI and S. BORGHESI</i> (lvi): <u>Working Too Much in a Polluted World: A North-South Evolutionary Model</u>
ETA	45.2002	<i>P. G. FREDRIKSSON, Johan A. LIST and Daniel MILLIMET</i> (lvi): <u>Chasing the Smokestack: Strategic Policymaking with Multiple Instruments</u>
ETA	46.2002	<i>Z. YU</i> (lvi): <u>A Theory of Strategic Vertical DFI and the Missing Pollution-Haven Effect</u>
SUST	47.2002	<i>Y. H. FARZIN</i> : <u>Can an Exhaustible Resource Economy Be Sustainable?</u>
SUST	48.2002	<i>Y. H. FARZIN</i> : <u>Sustainability and Hamiltonian Value</u>
KNOW	49.2002	<i>C. PIGA and M. VIVARELLI</i> : <u>Cooperation in R&D and Sample Selection</u>
Coalition Theory Network Coalition Theory Network	50.2002	<i>M. SERTEL and A. SLINKO</i> (liv): <u>Ranking Committees, Words or Multisets</u>
ETA	51.2002	<i>Sergio CURRARINI</i> (liv): <u>Stable Organizations with Externalities</u>
ETA	52.2002	<i>Robert N. STAVINS</i> : <u>Experience with Market-Based Policy Instruments</u>
ETA	53.2002	<i>C.C. JAEGER, M. LEIMBACH, C. CARRARO, K. HASSELMANN, J.C. HOURCADE, A. KEELER and R. KLEIN</i> (liii): <u>Integrated Assessment Modeling: Modules for Cooperation</u>
CLIM	54.2002	<i>Scott BARRETT</i> (liii): <u>Towards a Better Climate Treaty</u>
ETA	55.2002	<i>Richard G. NEWELL and Robert N. STAVINS</i> : <u>Cost Heterogeneity and the Potential Savings from Market-Based Policies</u>
SUST	56.2002	<i>Paolo ROSATO and Edi DEFRANCESCO</i> : <u>Individual Travel Cost Method and Flow Fixed Costs</u>
SUST	57.2002	<i>Vladimir KOTOV and Elena NIKITINA</i> (lvii): <u>Reorganisation of Environmental Policy in Russia: The Decade of Success and Failures in Implementation of Perspective Quests</u>
SUST	58.2002	<i>Vladimir KOTOV</i> (lvii): <u>Policy in Transition: New Framework for Russia's Climate Policy</u>
SUST	59.2002	<i>Fanny MISSFELDT and Arturo VILLAVICENCO</i> (lvii): <u>How Can Economies in Transition Pursue Emissions Trading or Joint Implementation?</u>
VOL	60.2002	<i>Giovanni DI BARTOLOMEO, Jacob ENGWERDA, Joseph PLASMANS and Bas VAN AARLE</i> : <u>Staying Together or Breaking Apart: Policy-Makers' Endogenous Coalitions Formation in the European Economic and Monetary Union</u>
ETA	61.2002	<i>Robert N. STAVINS, Alexander F. WAGNER and Gernot WAGNER</i> : <u>Interpreting Sustainability in Economic Terms: Dynamic Efficiency Plus Intergenerational Equity</u>
PRIV	62.2002	<i>Carlo CAPUANO</i> : <u>Demand Growth, Entry and Collusion Sustainability</u>
PRIV	63.2002	<i>Federico MUNARI and Raffaele ORIANI</i> : <u>Privatization and R&D Performance: An Empirical Analysis Based on Tobin's Q</u>
PRIV	64.2002	<i>Federico MUNARI and Maurizio SOBRERO</i> : <u>The Effects of Privatization on R&D Investments and Patent Productivity</u>
SUST	65.2002	<i>Orley ASHENFELTER and Michael GREENSTONE</i> : <u>Using Mandated Speed Limits to Measure the Value of a Statistical Life</u>
ETA	66.2002	<i>Paolo SURICO</i> : <u>US Monetary Policy Rules: the Case for Asymmetric Preferences</u>
PRIV	67.2002	<i>Rinaldo BRAU and Massimo FLORIO</i> : <u>Privatisations as Price Reforms: Evaluating Consumers' Welfare Changes in the U.K.</u>
CLIM	68.2002	<i>Barbara K. BUCHNER and Roberto ROSON</i> : <u>Conflicting Perspectives in Trade and Environmental Negotiations</u>
CLIM	69.2002	<i>Philippe QUIRION</i> : <u>Complying with the Kyoto Protocol under Uncertainty: Taxes or Tradable Permits?</u>
SUST	70.2002	<i>Anna ALBERINI, Patrizia RIGANTI and Alberto LONGO</i> : <u>Can People Value the Aesthetic and Use Services of Urban Sites? Evidence from a Survey of Belfast Residents</u>
SUST	71.2002	<i>Marco PERCOCO</i> : <u>Discounting Environmental Effects in Project Appraisal</u>
NRM	72.2002	<i>Philippe BONTEMS and Pascal FAVARD</i> : <u>Input Use and Capacity Constraint under Uncertainty: The Case of Irrigation</u>
PRIV	73.2002	<i>Mohammed OMRAN</i> : <u>The Performance of State-Owned Enterprises and Newly Privatized Firms: Empirical Evidence from Egypt</u>
PRIV	74.2002	<i>Mike BURKART, Fausto PANUNZI and Andrei SHLEIFER</i> : <u>Family Firms</u>
PRIV	75.2002	<i>Emmanuelle AURIOL, Pierre M. PICARD</i> : <u>Privatizations in Developing Countries and the Government Budget Constraint</u>
PRIV	76.2002	<i>Nichole M. CASTATER</i> : <u>Privatization as a Means to Societal Transformation: An Empirical Study of Privatization in Central and Eastern Europe and the Former Soviet Union</u>

PRIV	77.2002	<i>Christoph LÜLSFESMANN</i> : <u>Benevolent Government, Managerial Incentives, and the Virtues of Privatization</u>
PRIV	78.2002	<i>Kate BISHOP, Igor FILATOTCHEV and Tomasz MICKIEWICZ</i> : <u>Endogenous Ownership Structure: Factors Affecting the Post-Privatisation Equity in Largest Hungarian Firms</u>
PRIV	79.2002	<i>Theodora WELCH and Rick MOLZ</i> : <u>How Does Trade Sale Privatization Work? Evidence from the Fixed-Line Telecommunications Sector in Developing Economies</u>
PRIV	80.2002	<i>Alberto R. PETRUCCI</i> : <u>Government Debt, Agent Heterogeneity and Wealth Displacement in a Small Open Economy</u>
CLIM	81.2002	<i>Timothy SWANSON and Robin MASON</i> (Ivi): <u>The Impact of International Environmental Agreements: The Case of the Montreal Protocol</u>
PRIV	82.2002	<i>George R.G. CLARKE and Lixin Colin XU</i> : <u>Privatization, Competition and Corruption: How Characteristics of Bribe Takers and Payers Affect Bribe Payments to Utilities</u>
PRIV	83.2002	<i>Massimo FLORIO and Katuscia MANZONI</i> : <u>The Abnormal Returns of UK Privatisations: From Underpricing to Outperformance</u>
NRM	84.2002	<i>Nelson LOURENÇO, Carlos RUSSO MACHADO, Maria do ROSÁRIO JORGE and Luís RODRIGUES</i> : <u>An Integrated Approach to Understand Territory Dynamics. The Coastal Alentejo (Portugal)</u>
CLIM	85.2002	<i>Peter ZAPFEL and Matti VAINIO</i> (Iv): <u>Pathways to European Greenhouse Gas Emissions Trading History and Misconceptions</u>
CLIM	86.2002	<i>Pierre COURTOIS</i> : <u>Influence Processes in Climate Change Negotiations: Modelling the Rounds</u>
ETA	87.2002	<i>Vito FRAGNELLI and Maria Erminia MARINA</i> (Iviii): <u>Environmental Pollution Risk and Insurance</u>
ETA	88.2002	<i>Laurent FRANCKX</i> (Iviii): <u>Environmental Enforcement with Endogenous Ambient Monitoring</u>
ETA	89.2002	<i>Timo GOESCHL and Timothy M. SWANSON</i> (Iviii): <u>Lost Horizons. The noncooperative management of an evolutionary biological system.</u>
ETA	90.2002	<i>Hans KEIDING</i> (Iviii): <u>Environmental Effects of Consumption: An Approach Using DEA and Cost Sharing</u>
ETA	91.2002	<i>Wietze LISE</i> (Iviii): <u>A Game Model of People's Participation in Forest Management in Northern India</u>
CLIM	92.2002	<i>Jens HORBACH</i> : <u>Structural Change and Environmental Kuznets Curves</u>
ETA	93.2002	<i>Martin P. GROSSKOPF</i> : <u>Towards a More Appropriate Method for Determining the Optimal Scale of Production Units</u>
VOL	94.2002	<i>Scott BARRETT and Robert STAVINS</i> : <u>Increasing Participation and Compliance in International Climate Change Agreements</u>
CLIM	95.2002	<i>Banu BAYRAMOGLU LISE and Wietze LISE</i> : <u>Climate Change, Environmental NGOs and Public Awareness in the Netherlands: Perceptions and Reality</u>
CLIM	96.2002	<i>Matthieu GLACHANT</i> : <u>The Political Economy of Emission Tax Design in Environmental Policy</u>
KNOW	97.2002	<i>Kenn ARIGA and Giorgio BRUNELLO</i> : <u>Are the More Educated Receiving More Training? Evidence from Thailand</u>
ETA	98.2002	<i>Gianfranco FORTE and Matteo MANERA</i> : <u>Forecasting Volatility in European Stock Markets with Non-linear GARCH Models</u>
ETA	99.2002	<i>Geoffrey HEAL</i> : <u>Bundling Biodiversity</u>
ETA	100.2002	<i>Geoffrey HEAL, Brian WALKER, Simon LEVIN, Kenneth ARROW, Partha DASGUPTA, Gretchen DAILY, Paul EHRlich, Karl-Goran MALER, Nils KAUTSKY, Jane LUBCHENCO, Steve SCHNEIDER and David STARRETT</i> : <u>Genetic Diversity and Interdependent Crop Choices in Agriculture</u>
ETA	101.2002	<i>Geoffrey HEAL</i> : <u>Biodiversity and Globalization</u>

(xlii) This paper was presented at the International Workshop on "Climate Change and Mediterranean Coastal Systems: Regional Scenarios and Vulnerability Assessment" organised by the Fondazione Eni Enrico Mattei in co-operation with the Istituto Veneto di Scienze, Lettere ed Arti, Venice, December 9-10, 1999.

(xliii) This paper was presented at the International Workshop on "Voluntary Approaches, Competition and Competitiveness" organised by the Fondazione Eni Enrico Mattei within the research activities of the CAVA Network, Milan, May 25-26, 2000.

(xliv) This paper was presented at the International Workshop on "Green National Accounting in Europe: Comparison of Methods and Experiences" organised by the Fondazione Eni Enrico Mattei within the Concerted Action of Environmental Valuation in Europe (EVE), Milan, March 4-7, 2000

(xlv) This paper was presented at the International Workshop on "New Ports and Urban and Regional Development. The Dynamics of Sustainability" organised by the Fondazione Eni Enrico Mattei, Venice, May 5-6, 2000.

(xlvi) This paper was presented at the Sixth Meeting of the Coalition Theory Network organised by the Fondazione Eni Enrico Mattei and the CORE, Université Catholique de Louvain, Louvain-la-Neuve, Belgium, January 26-27, 2001

(xlvii) This paper was presented at the RICAMARE Workshop "Socioeconomic Assessments of Climate Change in the Mediterranean: Impact, Adaptation and Mitigation Co-benefits", organised by the Fondazione Eni Enrico Mattei, Milan, February 9-10, 2001

(xlviii) This paper was presented at the International Workshop "Trade and the Environment in the Perspective of the EU Enlargement", organised by the Fondazione Eni Enrico Mattei, Milan, May 17-18, 2001

(xlix) This paper was presented at the International Conference “Knowledge as an Economic Good”, organised by Fondazione Eni Enrico Mattei and The Beijer International Institute of Environmental Economics, Palermo, April 20-21, 2001

(l) This paper was presented at the Workshop “Growth, Environmental Policies and Sustainability” organised by the Fondazione Eni Enrico Mattei, Venice, June 1, 2001

(li) This paper was presented at the Fourth Toulouse Conference on Environment and Resource Economics on “Property Rights, Institutions and Management of Environmental and Natural Resources”, organised by Fondazione Eni Enrico Mattei, IDEI and INRA and sponsored by MATE, Toulouse, May 3-4, 2001

(lii) This paper was presented at the International Conference on “Economic Valuation of Environmental Goods”, organised by Fondazione Eni Enrico Mattei in cooperation with CORILA, Venice, May 11, 2001

(liii) This paper was circulated at the International Conference on “Climate Policy – Do We Need a New Approach?”, jointly organised by Fondazione Eni Enrico Mattei, Stanford University and Venice International University, Isola di San Servolo, Venice, September 6-8, 2001

(liv) This paper was presented at the Seventh Meeting of the Coalition Theory Network organised by the Fondazione Eni Enrico Mattei and the CORE, Université Catholique de Louvain, Venice, Italy, January 11-12, 2002

(lv) This paper was presented at the First Workshop of the Concerted Action on Tradable Emission Permits (CATEP) organised by the Fondazione Eni Enrico Mattei, Venice, Italy, December 3-4, 2001

(lvi) This paper was presented at the ESF EURESCO Conference on Environmental Policy in a Global Economy “The International Dimension of Environmental Policy”, organised with the collaboration of the Fondazione Eni Enrico Mattei, Acquafredda di Maratea, October 6-11, 2001

(lvii) This paper was presented at the First Workshop of “CFEWE – Carbon Flows between Eastern and Western Europe”, organised by the Fondazione Eni Enrico Mattei and Zentrum für Europäische Integrationsforschung (ZEI), Milan, July 5-6, 2001

(lviii) This paper was presented at the Workshop on “Game Practice and the Environment”, jointly organised by Università del Piemonte Orientale and Fondazione Eni Enrico Mattei, Alessandria, April 12-13, 2002

2002 SERIES

CLIM *Climate Change Modelling and Policy* (Editor: Marzio Galeotti)

VOL *Voluntary and International Agreements* (Editor: Carlo Carraro)

SUST *Sustainability Indicators and Environmental Evaluation*
(Editor: Carlo Carraro)

NRM *Natural Resources Management* (Editor: Carlo Giupponi)

KNOW *Knowledge, Technology, Human Capital* (Editor: Dino Pinelli)

MGMT *Corporate Sustainable Management* (Editor: Andrea Marsanich)

PRIV *Privatisation, Regulation, Antitrust* (Editor: Bernardo Bortolotti)

ETA *Economic Theory and Applications* (Editor: Carlo Carraro)