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BOOK OF ABSTRACTS

Session 1

History & Geography

Biodiversity and Geography

by
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and
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The paper combines an economic-geography model of agglomeration and periphery with a model of species diversity and looks at optimal policies of biodiversity conservation. The subject of the paper is "natural" biodiversity, which is inevitably impaired by anthropogenic impact. Thus, the economic and the ecological system compete for space and the question arises as to how this conflict should be resolved. The decisive parameters of the model are related to biological diversity (endemism vs. redundancy of species) and the patterns of economic geography (centrifugal and centripetal forces). As regards the choice of environmental-policy instruments, it is shown that Pigouvian taxes do not always establish the optimal allocation.

What drives long-run biodiversity change?
New insights from combining economics, paleoecology and environmental history

by
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This paper presents a new approach to understanding the effects of economic factors on biodiversity change over the long run. We illustrate this approach by studying the determinants of biodiversity change in upland Scotland from 1600-2000. The measure of biodiversity used is a proxy for plant species diversity, constructed using statistical analysis of paleoecological (pollen) data. We assemble a new data set of historical land use and price data over 11 sites during this400 year period; this data set also includes information on changes in agricultural technology, climate and land ownership. A panel model is then estimated, which controls for both supply and demand shifts over time. A main result is that prices, which act in our model as a proxy for livestock numbers, do indeed impact on biodiversity, with higher prices leading to lower plant diversity.

4

Session 2

Valuation

The Role of Use and Non-use Values in Environmental Valuation:
Do they matter in Scope Tests?

by
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Scope insensitivity has been a common result in many contingent valuation studies applied to high non-use value resources. Previous studies have explained these results with different arguments, such as the theory of diminishing marginal existence values or even going as far as questioning the validity of contingent valuation method (CVM). In this paper, we conduct a meta-analysis on scope tests underlining the role played by use and non-use values. We also analyze scope test failures applying the CVM to the valuation of high use and high non-use resources. We obtain insensitivity to scope for both high use and high non-use environmental goods. Nevertheless, social desirability bias are detected and removed from the sample obtaining scope sensitivity in all cases, where high use species show positive scope and high non-use species show negative scope. Results are commented and discussed in order to shed some light on previous scope test failures surrounding non-use values**.**

Economic Valuation of Forest Quality Change in the Jizerske hory Mountains: the Evidence from Contingent Behavior Study

by
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This paper presents a travel cost study which was conducted for the purpose of estimating a recreation value to the Jizerske hory Mountains in the Czech Republic. In addition, the welfare change of recreation users associated with damage on the forest quality was estimated using contingent behavior model. In the study, the single site travel cost model with a Poisson specification was applied. The contingent behavior model relied on both observed behaviors and stated behaviors to infer the change of value associated with forest recreation in this area. Both actual trips and intended trips were pooled under the hypothetical scenario to estimate the value of four public programs, including the change in the forest quality. To gather information about respondents, the survey was conducted on-site during September and October, 2005. A total of 312 questionnaires were completed. The consumer surplus per trip to the site under the current conditions was about USD 18 using Poisson model, USD 17 (truncated Poisson) and USD 56 (truncated Negative Binominal). There was significant evidence of overdispersion that is why the negative binominal regression model was preferred to the Poisson model. The decrease in the welfare change in the access value associated with the impacts of air pollution on the quality of forest ecosystems was estimated at CZK 67 for one trip (USD 3).

Session 3

Knowledge

Knowledge matters: Institutional Frameworks to Govern the Provision of Global Public Goods

by

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This paper seeks to analyze on a new-institutional economic foundation the mechanisms by which certain issues can be recognized by global citizens (and decision makers) as of common concern. This implies that citizens have to recognize their interdependencies and their dependence on the community to address certain issues. They then have to assess the value of the related "goods" in the hierarchy of their individual preferences. The costs — i.e. the resources to be dedicated to the production of these goods — have also to be assessed, in particular on an individual basis. Then mechanisms of aggregation are needed to compare costs and benefits both at a collective level — to make efficient collective choices — and at an individual level — to check the individual desirability of the alternative goods given the possible solutions to provide them. Of course the later strongly depends upon the institutional solutions chosen to provide the good. These various operations do not consist only in revealing and aggregating individual preferences and assessment. In a world of bounded rationality, all of them are depending upon the production of knowledge and upon its distribution to the citizens and to the decisions makers; otherwise neither individual preferences, nor individual and collective benefits/costs assessments can be made. As mentioned above, this knowledge concerns the nature of the good — to what extent resources as stability of the climate or biodiversity are of value for human beings, are public goods, are global rather than local PG? —, the technical solutions to provide them — which include an economic assessment of the costs and constraints such as irreversibilities and risks of provision, and also analysis of the distribution of these costs — , and also the interdependences among these goods — indeed, in a world of scarcity there is competition among the various public goods. We therefore seek to better understand how alternative institutional solutions are efficient in generating knowledge and on ensuring its distribution to make sure that well-informed citizens could take collective decisions.

Taboos, social norms and conservation in the eastern rainforests of Madagascar

by
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Where enforcement capacity for externally defined rules is weak, informal institutions which regulate access to wild species are of great interest to conservationists. A system of prohibitions known as fady is central to Malagasy culture. We look at the fady that affect natural resource use in the eastern rainforests of Madagascar, discuss whether they originate in attempts to manage natural resources and whether they play an important conservation role. We found a range of prohibitions from strict taboos where a species or area was forbidden by the ancestors, to social norms concerning acceptable behaviour when harvesting wild species. We found that strict taboos offered real protection to some threatened species including the lemur Propithecus edwardsi and the carnivore Cryptoprocta ferox. Taboos also reduced pressure on some economically important endemic species such as freshwater crayfish, by preventing their sale or limiting the harvest season. Social norms, where the sanction was social disapproval rather than supernatural retribution, encouraged sustainable harvesting practices for tenrecs and pandans. We found some evidence that the imposition of external conservation rules may have led to the break-down of such social norms by taking management power away from local people. In areas where forests were under community management, a social norm dictating how pandans should be harvested to avoid waste was widely respected (>90% of harvested pandans we saw had been harvested in this way). However, in forests within Ranomafana National Park, where local people have no rights to harvest products, less than 3% of harvested pandans we observed had been harvested according to the stated best practice. Many of the people closest to Madagascar's remaining biodiversity-rich habitat live in societies where traditional beliefs and societal norms governing interactions with wild species are powerful. Conservationists should make more effort to understand such existing institutions which, especially in the absence of capacity to enforce externally defined rules, may play an important conservation role.

Session 4

Wildlife

On the Economics of Ecological Nuisance

by

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This paper analyses the economics of pest and nuisance relating to wild animals. It studies stylised models where wild animals represent a direct nuisance to agricultural production through grazing and crop damage. Such damage is particularly relevant in poor rural communities, where people are dependent on livestock and crop production and at the same time are living close to nature and wildlife. The analysis encompasses both situations involving nuisance costs only and cases where the wildlife may also have a harvesting value.
In both instances, the emphasis is on large mammals and criteria for optimal species eradication are analysed in particular.

Session 5

Resources

The Resource Curse Revisited and Revised:
A Tale of Paradoxes and Red Herrings

by

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We critically evaluate the empirical basis for the so-called resource curse and find that, despite the topic's popularity in economics and political science research, this apparent paradox is a red herring. The most commonly used measure of 'resource abundance' can be more usefully interpreted as a proxy for 'resource dependence'—endogenous to underlying structural factors. In multiple estimations that combine resource abundance and dependence, institutional and constitutional variables, we find that (i) resource abundance, constitutions and institutions determine resource dependence, (ii) resource dependence does not affect growth, and (iii) resource abundance positively affects growth and institutional quality.

Session 6

Policy

Seeing REDD: Reducing Emissions and Conserving Biodiversity by Avoiding Deforestation

by

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Deforestation accounts for 20-25% of greenhouse gas emissions. It is also a major and immediate cause of global biodiversity loss. Protection of existing forests through Reduced Emissions from Deforestation and Degradation (REDD), therefore, has the potential to deliver both climate change mitigation and biodiversity conservation benefits. This paper explores how these complementary goals can be supported by international payments for ecosystem services (IPES) via the emerging global carbon market. REDD, through an IPES framework, offers an opportunity to 'bundle' payments for reduced emissions with payments for biodiversity conservation and possibly other ecosystem services. Bundling payments for reduced emissions and biodiversity conservation in this way allows for cost-sharing between the multiple beneficiaries of REDD projects. This paper outlines potential cost-sharing arrangements between carbon investors financing reduced emissions and beneficiaries of biodiversity conservation provided by REDD. Two possible mechanisms for bundling payments are discussed. One scheme combines finances from general biodiversity beneficiaries as a whole with carbon investments in REDD through a global fund; a second scheme matches payments from specific biodiversity beneficiaries with investments in REDD through a payment 'partnership' between both groups. The aim in both cases is to achieve two complementary environmental goals at an overall lower cost.

Session 7

Commons

Do binding agreements solve the social dilemma?

by

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We investigate whether "binding agreements" can provide a solution to the social dilemma that arises in the presence of pure public goods. Signing a binding agreement can prevent players to free ride on the contributions to the public good. However, a well known theoretical result is that the outcome of the endogenous formation of agreements is not necessarily efficient. In our setting, the individual level of contribution to the public good increases with the size of the coalition reaching an agreement and the global agreement is always the socially optimal structure. Agreements form sequentially. The equilibrium outcome is an asymmetric structure, which consists of two coalitions of different sizes, the small one free riding on the contributions of the bigger one. We run an experiment that lends force to the theoretical result that outcomes may be inefficient. In fact, we observe an outcome which is even less efficient than the one predicted by the equilibrium agreement structure. However, it seems that when subjects reach agreements they do so with the intention of cooperating rather than free riding. Furthermore, it seems that they "learn to cooperate" over time and reach the global agreement more often towards the end of sessions.

Sustainable agriculture grants programs and the subsidy free rider problem

by

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One of the recurring issues in agriculture is how to stimulate conservation of biodiversity on private lands. In most instances individual farmers have little incentives to switch to ecologically sound agricultural production techniques as profits tend to be higher using standard techniques (based on mechanized farming, use of pesticides and artificial fertilizers, etc.). Because there are positive externalities of farmers switching to environmentally friendly techniques (for example because fewer pesticides need to be used), the government may decide to stimulate adoption by means of a subsidizing the use of ecologically sound techniques while inducing active use of these technologies by imposing taxes in case actual biodiversity levels do not meet the government's standard.

However, not all farmers are likely to require the same amount of subsidies in order to switch to ecological farming techniques; some plots are more amenable to ecological production techniques than others. Assuming that full adoption of ecological techniques is socially optimal, the simplest possible approach is to provide sufficiently generous subsidies such that the farm type that incurs the largest costs when switching marginally prefers to adopt. But that means that farm types with lower switching costs have a windfall gain; it may even be the case that adoption would have been profitable even with zero subsidies.

If subsidies were a straightforward transfer from the government to the farmer, these windfall profits would not constitute a welfare loss. However, because the funds for subsidies need to be raised by means of distortionary taxation elsewhere in the economy, under perfect information the optimal policy would be to provide subsidies such that all farmers marginally prefer to adopt. Information about the feasibility of ecologically friendly techniques is more likely to be private, though, and hence the government would like to be able to induce farmers to self-select into those who need the larger subsidies from those that need a smaller (or possibly zero) subsidy.

We argue that by the simultaneous use of taxes and subsidies farmer types can be induced to self-select into those who need a larger net subsidy to adopt, and those who require a smaller subsidy. We consider two policy regimes. The first consists of a subsidy on technology choice (i.e., when switching to ecological techniques) and of a tax on biodiversity loss (that is, on the extent to which farmers fail to accomplish conservation because of a lack of effort, taking their technology choice into account. The second is where continued use of traditional techniques is taxed lump-sum but where the amount of conservation effort undertaken is subsidized.

We find that in general, separating the two farm types is very easy independent of which regime is being used, but also that separation is never welfare enhancing.

Session 8

Agriculture

Risk Management in a Semi-Arid Rangeland System – the Role of Rain-Index Insurances

by

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The livelihood of the majority of people in (semi-)arid regions depends on livestock farming. Inappropriate grazing strategies can lead to land degradation, i.e. loss of pasture productivity. Moreover, the highly variable and uncertain precipitation translates into a highly uncertain income. Rain-index insurance provides the possibility of hedging income risk. This study investigates how the access to rain-index insurance influences the grazing strategy of a farmer. The starting point for the analysis of different grazing strategies is the case study of a farm in Namibia successful in ecological and economic terms. With the help of an ecological-economic model, the farmer's choice of a grazing strategy with and without insurance is compared. The decision criterion applied is a safety-first rule. The results show that resting during wet years acts as a risk reducing strategy. Furthermore, it enables the farmer to maintain high pasture productivity over the long term. However, a farmer with access to insurance may change the grazing strategy towards less resting. The influential factors in this respect are his attitude towards risk and time horizon. Policy makers should be aware of the influence of economic risk management measures, such as insurances, on farmer's choice of grazing strategies, since they may have detrimental effects on the productivity of the rangeland ecosystem and, hence, on the long-term well-being of farmers. Therefore, an analysis including explicitly ecological and economic feedback mechanisms of the land use system is a prerequisite.

**Biodiversity Protection and Economic Development in Kakamega District, Kenya:
The Challenge to Social Capital**

by

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The interrelationship between economic development, biodiversity protection and its respective facilitation through what is called 'social capital' is a complex one. This paper draws on research undertaken in Kakamega District, Kenya to address the question of possible preconditions and prospects of reconciling economic development and biodiversity protection through a) enhancing agricultural biodiversity, and b) diversifying rural household income. Effects of declining agricultural productivity, climate change and shocks are discussed with a view to current response options, including the use of social capital. The paper argues to be cautious towards the promise of social capital resources when high levels of poverty persist and major shocks are beyond the adaptability of individual households. This leaves ample room for discussing the need of interventions at the regional and national level.

Session 9

Valuation

Benefits of Biodiversity Enrichment due to Forest Conversion: Evidence from two Choice Experiments in Germany

by

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Forest biodiversity has recently received increasing attention because forest ecosystems are critically important habitats in terms of biological diversity. However, although many non-marketed non-timber products provided by forest ecosystems have been subject to non-market valuation studies, little is known about the economic value of forest biodiversity at present apart from the value of genetic information. This applies to both tropical and temperate forests. In order to determine the benefits from enriched forest biodiversity, we employed choice experiments in two regions in Lower Saxony, Germany. As they are attribute based, we expected to obtain more information about how people value changes in biodiversity compared to the contingent valuation but the choice experiments only provided limited information about this since we found no significant differences between several implicit prices. Calculating the welfare measures shows that including the alternative specific constant or not switches the measure from negative to positive and vice-versa. This is also the case when we exclude all the respondents who always chose the status quo option.

Exploring diversity: a meta-analysis of wetland conservation and creation

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The rationale for conservation and creation of wetlands is bounded by the recognition of both their ecological and economic values. This paper examines the welfare impacts of goods and services provided by wetlands. We collected 353 observations on the economic value of natural and man-made wetlands from 155 studies worldwide. The resulting database is less biased towards North America than previous reviews of the literature. The relative importance of characteristics of the valuation study, of the wetland site and of the socio-economic and geographical context is estimated by means of a meta-regression of wetland values. Water quality improvement, provision of amenity and biodiversity enhancement are the most highly valued wetland services. The relevance of the socio-economic and geographical context clearly emerges from the analysis and, in particular, the proximity to other wetland sites is negatively correlated with values. An analysis of the effect of environmental stress on wetland value shows that the latter increases with stress from human development activities and uses.

Session 10

Wildlife

Grandma or the Wolf?
A Real Options Framework for Managing Human-Wildlife Conflicts

by

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As wildlife habitats shrink, some species are pushed into extinction, while conflicts with others increase and cause significant economic damages. This paper proposes a simple real options framework to analyze wildlife management policies that account for ecological uncertainty and the risk of extinction. Our application to wolves provides an economic justification for their reintroduction and highlights the importance of existence value. Our sensitivity analysis shows that the optimal management policy depends on the growth rate, the volatility, and the minimum viable density of the wolf population, but little on damages, existence value, and the discount rate for the parameters considered.

Assessing the Prospects for Community Based Wildlife Management: Are Social Capital and Leadership Influences Conflated?

by

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Conventional wisdom suggests that more social capital leads to greater cooperation and increased participation in community natural resource management schemes. In this paper, we inquire whether this argument is too simplistic, perhaps ignoring various complexities. For example, social capital may be a multi-dimensional concept and its effects on participation in community natural resource management may be conflated with other household characteristics that influence participation. Gaining the support of local leaders is cited as a critical element in spurring community action and, coincidentally, leaders also are likely to exhibit high levels of social capital. However, leaders' support for community natural resource management may be unpredictable; rather than correlate with a high level of social capital, it may rest on a shrewd assessment of self-interest. Indeed, high household social capital might actually correlate with lowered willingness to participate in community natural resource management, if participation is not sufficiently rewarding or its opportunity costs are too high. To examine this hypothesis, we surveyed households in Khumbu, Nepal and asked about their social capital characteristics. We also asked if households would participate in a hypothetical community natural resource management scheme involving the endangered Himalayan musk deer, given a randomly drawn payoff. Using a random utility framework, we estimate a probit model of participation in the hypothetical scheme and show that leader types are less likely to support the scheme than others, despite demonstrating high levels of social capital. These results suggest that assessing the prospects for community natural resource management requires careful consideration of the complex interactions between social capital and other household characteristics.

Session 11

Bioprospecting

Is the value of bioprospecting contracts too low?

by

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In order to regulate the proliferated bioprospecting and protect the biological diversity in the source countries, the Convention on Biological Diversity (CBD) established a legal framework for the reciprocal transfer of biological materials between the interested parties in bioprospecting activities, subject to the Prior Informed Content (PIC) principles and a set of mutually agreed items on equitable sharing of benefits (CBD 1992, Bhat 1999; Ten Kate and Laird 1999; Dedeurwaerdere 2005). Although interesting and valuable to the cause of conservation, there is a feeling that the 'price' being paid under these arrangements is too low. Somehow ecologists argue that, surely, these materials have a greater value than the few million dollars being paid to national conservation organizations for the protection of the areas where the material are located. In this paper we seek to understand better how a biodiversity resource' use value in production is determined, and how the real value is obscured by the fact that the resource is largely open access.
We attempt to analyse how special arrangements, set op top of a basic framework in which the resource open access is limited in what it can achieve and in the 'price' that will emerge from any transaction between the buyers of the rights and the sellers of the rights.

On the Distribution of Benefits Arising From Bioprospecting between the North and the South

by
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Bioprospecting is a measure aiming at protecting biodiversity. It is based on the Convention on Biological Diversity (CBD), which states that the benefits arising out of the utilization of genetic resources should be shared on a fair and equitable basis between the contracting countries. The attempt of this paper is to investigate theoretically the issue of distribution of benefits between a developed and a developing country (the North and the South) in bioprospecting for pharmaceutical products by using the genetic resources in the rainforest possessed by the South. We show that the South should gain nothing from the profits obtained from commercialization of the pharmaceutical product if it does not contribute to R&D; in this case, the South should receive monetary transfers only according to the scale of the rainforest conserved. However, this is not true if the North is the leader of the contract and if certain conditions are satisfied. Also, if the South contributes to R&D with traditional knowledge, it is demonstrated that the profits should be shared between the North and the South according to the level of contribution to R&D.

Session 12

Knowledge

Auctioning plant biodiversity – a promising new instrument within the European agrienvironmental policy? Evidence from a case study

by

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The European Union's Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) has introduced auctioning as a new instrument for granting agri-environmental payments and awarding conservation contracts. The paper presents an evaluation of auctions with respect to ecological services in agrarian landscapes within a case study area in Germany. Results from two auctions show much differentiated bid prices and clarify the practical potential for a more efficient use of public funds by the use of auctions compared to fixed flat-rate payments. Furthermore a discussion of the farmers' transaction costs defined as the weighted time expenditure of the proposal preparation points out their comparative low relevance as well as a decrease from the first to the second auction.

Strategies for Ex-Situ Conservation for Society and Industry:
Empirical Analysis of Microbes

by
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This paper sheds some light on the relationship between crop biodiversity on farms and market using cross-sectional data of banana growing households in Uganda. The reciprocity of the relationship between diversity on-farm and the involvement of farmers in banana markets is estimated using a two-stage estimation approach. Market involvement is analyzed both in terms of 1) the decision to participate in banana markets (as either a net seller or a net buyer), and 2) the composition of participation, measured by the number of varieties sold at farm-gate. The results suggest that diversity on household farms constitutes a necessary condition for both market participation in banana markets and diversity at farm-gate. Hence, greater diversity on-farm, as a cumulative stock of attributes, can increase cash flows to households (i.e. private benefits) through diversified production and sales without compromising *in-situ* conservation efforts. However, the presence of diversity on farm does not guarantee participation and its composition. That is, the reciprocal causation in the relationship is not statistically significant suggesting that diversity on farm is not a sufficient condition for market participation and its composition.

Session 13

Conservation Policy

On The Welfare Aspects of Species Conservation Policy:
A Stochastic Dominance Approach

by

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and

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We expose a model of collective choice under uncertainty in the presence of a public good. The model was inspired by our concern for articulating the welfare aspects of species conservation policy, but thorough consideration of the issues uncovered necessitated an approach that has significance well beyond the domain of conservation planning. We begin by defining a stochastic process that generates levels of a jointly consumed good, the provision of which concerns a benevolent planner and a collection of rational individuals, *I*. Next, we assume a non-paternalistic role for the planner who identifies social efficiency by appealing to the Pareto criterion. To place our work in a context that relates directly with the existing literature on conservation planning, we limit the scope of our analysis to focus on *cost-effective* plans, which are *cost-constrained* Pareto efficient. We find that identifying an efficient allocation at this level of generality requires appealing to the mechanism design literature, which is an impractical guide for policy. Subsequently, we seek additional restrictions that enable useful characterizations of the efficient set of conservation plans. These characterizations limit the degree to which individuals may disagree about the desirability of different policy outcomes and the probability of the outcomes occurring. Eventually, when disagreement about the ranking of outcomes and probability beliefs are completely eliminated, a representative agent framework arises and characterizations of the efficient set become very sharp and fragile.

Enforcement Aspects of Conservation Policies: Compensation Payments versus Reserves

by

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This model explicitly incorporates the dynamic aspects of conservation programs with incomplete compliance and it allows landholders' behaviour to change over time. A distinction is made between initial and continuing compliance. We find that incomplete enforcement can have a significant impact on the choice between subsidy schemes and reserves for conservation policies. The results suggest that it is useless to design a conservation scheme for landholders, if the regulator is not prepared to back the program with a monitoring and enforcement policy. In general, if the cost of using government revenues is sufficiently low and the environmental benefits are equal, the regulator will prefer to use compensation payments since the total compliance costs as well as the inspection costs will be lower. If the use of government funds is too costly, the reservetype instruments will be socially beneficial.

Session 14

Policy

Assessing Exposure of Financial Institutions to Biodiversity Business Risks and Identifying Options for Business Opportunities

by

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Following the spur of climate change up the international business agenda, biodiversity possesses characteristics of becoming the next challenge for the financial sector. This study aimed at assessing 1) what types of biodiversity business risks (BBRs) financial institutions (FIs) can be exposed to; 2) what evidence there is on the business case for biodiversity for FIs from a risk perspective; 3) what possibilities FIs have to mitigate BBRs; and 4) what type of biodiversity business opportunities (BBOs) can be captured. Results from an interview survey among financial institutions (FIs) and other stakeholders revealed that 19 out of 26 respondents (> 70%) believed FIs are exposed to reputational risk. Additional types of risks that were identified, although to a lesser extent, include liability risk, social license to operate, credit risk and reduced shareholder value. Though it is difficult, at present, to link biodiversity business risks (BBR) to tangible financial metrics, such as default risk or shareholder value, a wide range of cases provide evidence of the business case. However, apart from a few banks, such as Rabobank, HSBC, ABN AMRO and Goldman Sachs, FIs have hardly integrated the issue in their daily operations. Also, as the interview survey revealed that a number of FIs are definitely interested in identifying how they can mitigate risks at an early stage, a general procedure is provides a systematic overview of tools that FIs can use to integrate biodiversity into their risk management procedures. Although BBRs are likely to be more financially significant, there are a number of BBOs already in use, such as growing markets for certified sustainably produced commodities, providing due diligence and advisory services to clients, and fully utilizing government-induced opportunities. Expected market sizes range widely, from US$35 million – 60 billion annually by 2010.

Institutions for Payments for Environmental Services ;
Challenges and Opportunities in Uganda

by
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This paper looks at the policy frameworks and institutions required for functioning ecosystem service payment systems in general and highlights challenges and opportunities for Uganda. Every market requires basic rules and institutions in order to function. Policymakers and public agencies play a vital role in creating the legal and legislative frameworks necessary for market tools to operate effectively. This includes establishing regulatory rules, systems of rights over ecosystem services, and mechanisms to enforce contracts and settle ownership disputes. Ecosystem service markets pose profound equity implications, as new rules may fundamentally change the distribution of rights and responsibilities for essential ecosystem services. Government and civil society need to take a proactive role to ensure that rules support the public interest and create development opportunities. Institutions are also needed to provide the business services required in ecosystem service markets. For example, in order for beneficiaries of biodiversity services to become willing to pay for them, better methods of measuring and assessing biodiversity in working landscapes must be developed, as well as the institutional capacity to do it. New institutions must be created to encourage transactions and reduce transaction costs, such as "bundling" biodiversity services provided by large numbers of local producers, and investment vehicles that have a diverse portfolio of projects in order to manage risks. Registers must be established and maintained, to register payments and trades. For example, the Katoomba Group developed a webbased "Ecosystem Marketplace"1 in order to slash the information and transaction costs for buyers, sellers and intermediaries in ecosystem service markets.

Session 15

Forestry

Time-Inconsistent Preferences and the Option Value of Old-Growth Forest

by

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A forest owner with hyperbolic time preferences is considered. At each period the irreversible decision to harvest an old-growth forest could be taken. Conservation is the alternative. Future amenity valueflow is uncertain while the net value of stumpage timber is known and constant. The decision problem is expressed as an optimal stopping problem and solved analytically in a time-inconsistent framework. Under both the assumption of naïveté and sophistication premature harvesting occurs and the agent may rationally even decide to harvest with negative expected net present value (NPV). To avoid socially undesirable harvesting keeping into account the effect of hyperbolic discounting a modified optimal pigovian tax on the wood revenues is finally proposed.

Habitat diversity and forest harvesting strategies

by
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This paper studies economically optimal harvesting strategies in a forest landscape comprised by different habitat types. The analysis links a Markovian transition model of forest succession with an optimal control problem of forest management. The Markov model describes forest succession in the landscape based on transition probabilities for the change of the successinal stage of each forest patch in the landscape. The optimal control approach optimises harvest decisions where harvests are modelled as jump controls. They are two decisions to make: the intensity and timing of harvests in the climax patches of the forest. In this paper, we study the economically optimal harvesting rule to evaluate the drivers of the logging activities in this context and the forest habitat diversity associated with applying these optimal management strategies. The numerical results are derived from simulations of the forest dynamics parameterising the model for a tropical rain forest in Malaysia.

Session 16

Trade

Buffalo Hunt
International Trade and the Virtual Extinction of the North American Bison

By

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In the 16th century, North America contained 25-30 million bu¤alo; by the late 19th century less than 100 remained. While removing the bu¤alo east of the Mississippi took settlers over 100 years, the remaining 10 to 15 million bu¤alo on the Great Plains were killed in a punctuated slaughter in a little more than 10 years. I employ theory, data from international trade statistics, and .rst person accounts to argue that the slaughter was initiated by a foreign-made innovation and fueled by a foreign demand for industrial leather. Ironically, the ultimate cause of this sad chapter in American environmental history was of European, and not American, origin.

Session 17

Policy

Markets for Ecosystem Services:
A Potential Tool for Multilateral Environmental Agreements

by

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Ecosystems provide many services from which people benefit that cannot be bought or sold in the marketplace, such as clean water and erosion control. Unfortunately government regulation has not been sufficient to protect these services. An alternative policy approach is to create and develop market mechanisms that would improve the way ecosystem services are used. These markets for ecosystem services (MES) are increasingly recognized as having an important role to play in the sustainable use of ecosystem services and, more recently, in reducing poverty. These instruments can generate financial resources, divert funds to environmentally-friendly technologies, create incentives for investment and increase the involvement of the private business sector in environmental management. In light of the deteriorating trend in ecosystems highlighted by the Millennium Ecosystem Assessment (MA), MES can be expected to take on an increasing role in providing incentives for conservation and the sustainable use of ecosystem services. Furthermore, there is a potential for using MES to enhance the implementation of multilateral environmental agreements (MEAs).

Session 18

Valuing Biodiversity

Valuing Ecosystem Services Associated with Biodiversity:
An Exploration Using the Blackfly-Livestock System in South Africa

by
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and
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and
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The valuation of biodiversity is an emerging field with a variety of potential applications to different species mixes, habitats and ecosystem types. This paper first reviews progress in valuing biodiversity, paying particular attention to the approach proposed by Brock and Xepapadeas (2003). Then we develop a bioeconomic model of a representative agricultural activity subject to a pest whose population dynamics are regulated by an environmental driver (e.g. freshwater flows, hedgerow systems). Changes in the driver are linked stochastically to pest outbreaks, which are associated with dramatic shifts in the biodiversity state. Further, pest outbreaks lead to agricultural losses so that there is a linkage between changes in the environmental driver, biodiversity state and economic welfare. The formulation permits valuation of marginal changes in the drivers of biodiversity loss and, therefore, differs from the Brock and Xepapadeas approach. Using the example of the blackfly pest problem in the livestock economy of South Africa, we parameterize our model and show that the Brock and Xepapadeas measure can be derived from our results. Finally, the merits of the two alternative formulations are discussed. A need to emphasize the drivers of biodiversity change and adopt a marginal formulation for management purposes suggests that our valuation approach may be useful for a certain class of biodiversity problems.

Session 19

Habitat

Targeting Incentives to Reduce Habitat Fragmentation

by
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and
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The fragmentation of wildlife habitat has long been recognized as a principal threat to terrestrial biodiversity. In this paper, we develop a theoretical model to analyze the spatial targeting of incentives for the restoration of forested landscapes when land quality is spatially heterogeneous and wildlife habitat can be enhanced by reducing fragmentation. We consider a regulator who uses subsidies to encourage the conversion of private agricultural land to forest on a pre-defined set of landscapes. The regulator can observe land-use choices, but not the opportunity costs on individual land parcels. The important insight to emerge from the theoretical analysis is that solutions at or near corners are a strong possibility—on each landscape, either none or all of the agricultural land should be converted to forest. Corner solutions are directly linked to the spatial process determining habitat benefits. To verify the theoretical insight, we present a simulation of the effects of incentive-based policies on the spatial distribution of forests in South Carolina. The empirical methodology integrates an econometric model of land-use change with GIS-based landscape simulations. The empirical findings strongly support our conjecture regarding corner solutions, and the optimal targeting policy is shown to produce substantial welfare gains over a spatially-uniform incentive.

A Game Theory Analysis of the Transboundary Protected Area
as a Conservation Tool

by
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Nearly two hundred transboundary protected areas comprise a portion of he conservation landscape the size of India, with further expansion anticipated. Proponents claim that transboundary protected areas outperform isolated protected areas in achieving conservation objectives, while regional case studies have led critics to challenge this claim. Empirical investigation into the relative performance of transboundary protected areas is fundamentally limited since these areas can not be directly compared to the isolated protected areas that might otherwise have emerged in the same location. This paper develops a game theory model of park formation to compare transboundary and isolated protected area configurations across three criteria—national welfare, domestic conservation value, and global conservation value. The model suggests that when the primary objective of conservation is to prevent extinction or provide interior habitat, conservation groups should encourage transboundary protected areas. However, when the primary objective of conservation is to extend reserve coverage to the maximum number of species, conservation groups should encourage proteced areas in areas of greatest species richness, whether or not these areas span international borders.

Session 20

Ecology

A Bioeconomic Model of Non-Renewable Habitat-Fisheries Linkages

by
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A scientific knowledge gap exists with regard to how benthic habitat is affected by certain fishing methods, such as trawling, and how this impacts upon the productivity of commercial fish stocks. This paper addresses analytically the lack of knowledge pertaining to habitat-fishery linkages between a non-renewable habitat, such as deep water corals, and a renewable commercial fish stock which is harvested by both bottom trawlers and stationary gear users. We derive bioeconomic optimal steady states and show that in the case a habitat is preferred, harvesting costs are positively affected by habitat implying successively higher levels of optimal stock as the habitat is irreversibly destroyed, while an essential habitat can lead to the opposite, i.e. a lower input of habitat reduces the optimal stock level. The results are then evaluated in a bioeconomic model of marine protected areas (MPAs). We show that stationary gear users are much more likely to support MPAs when a habitat is preferred rather than essential.

Spatial Economic Analysis of Early Detection and Rapid Response Strategies for an Invasive Species

by
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Economic impacts from invasive species, conveyed as expected damages to assets from invasion and expected costs of successful prevention and/or removal, may vary significantly across spatially differentiated landscapes. In this work, we consider the effect of these spatial differences on early detection and rapid response (EDRR) policies, commonly exploited in the management of potential invaders around the world, for the Brown treesnake (Boiga irregularis) in Oahu, Hawaii. EDRR consists of search activities beyond the ports of entry, where search (and potentially removal) efforts are targeted toward areas where credible evidence suggests the presence of an invader. EDRR costs are a spatially dependent variable related to the ease or difficulty of searching an area, while still assuming damages to be a population dependent variable. Optimal EDRR search targets limited areas of high expected net damages. Only 14 8% of the island needs treatment in a thirty year period, if it is applied efficiently Inefficient search can be extremely costly, if it is random or incomplete. However comprehensive island-wide searches can reduce social welfare damages and may have additional external benefits, especially if prevention at entry points is highly effective at reducing the hazard rate. Optimally applied EDRR that integrates the costs, damages, and biological parameters of the snakes' potential presence can save the island $270m in present value losses to social welfare over 30 years. Synthesis and applications: Our results have the following implications for invasive species management and policy. First, treating EDRR as a separate but vital link between prevention at points of entry and control of 1 known populations allows for insights into the costs of delay at low or uncertain invasion population levels. Second, in spite of the fact that eradication through concerted island-wide sweeps can be profitable, it is not optimal. Finally, search should not be limited to the incoming points of entry. EDRR should be applied to high population density areas as well as areas that serve both as conduits to new territory (roads) and areas that would experience particularly high damages from high snake populations in them.

Session 21

Social Capital

Sowing the seeds of social relations:
the role of social capital in crop diversity

by
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and
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This paper explores the relationship between social capital and crop diversity. The study is conducted in an area of Ethiopia where inter-specific diversity is significant and that diversity includes crops that are of important in terms of their genetic value since it is a center of origin or diversity for these crops. The results indicate that linking social capital does not lead to a decline in crop diversity but actually increases it suggesting that interventions by formal organizations need not lead to reduction in inter-specific diversity. However, the results also suggest that households with strong social links within a community (bonding social capital) are less likely to be diversified implying that policies that seek to promote sustainable utilization should be wary of only working to promote greater grassroots organization since this may not support crop diversity.

Social capital in the establishment of a protected area:
the Gori_ko Park case study

by
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Research on natural resource management and biodiversity conservation is extremely preoccupied with formal arrangements, problem solving and participatory decision-making. However, not much research has been done on more informal arrangements such as social capital. Also not many have looked at how protected area establishment emerges, unfolds, and what role social capital plays in this regard. Following this, it is the aim of this paper to further examine an example of protected area establishment in Slovenia, a CEE country, explores barriers and bridges, and identify what role social capital had in this regard.

Session 22

Agriculture

Production Risk, Food Security and Crop Biodiversity:
Evidence from Barley Production in the Tigray Region, Ethiopia

by
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and
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This paper investigates the effects of crop biodiversity on farm productivity and risk management in the Tigray region of Ethiopia. Using a moment-based approach, the analysis relies on a flexible stochastic production function approach (Antle, 1983). Data are from 205 farms producing barley. Econometric results show that maintaining a larger number of barley varieties in the fields supports productivity and reduces the risk of crop failure. To study the welfare implications of diversity, a simulation exercise is presented. The analysis provides evidence that diversity helps reduce the risk of crop failure and the cost of risk (as measured by a risk premium). In general, the skewness effect can differ from the variance effect. In the context of biodiversity effects evaluated at sample means, we find that the skewness effect dominates the variance effect. Thus, under such circumstances, reducing the odds of crop failure can be more relevant that reducing yield variance.

Farmer Preferences for Milpa Diversity and Genetically Modified Maize in Mexico: A Latent Class Approach

by
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and
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and
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Mexico is the centre of origin of maize. Maize is typically grown as part of a set of associated crops and practices called the milpa system, an ancient mode of production that is practiced today in ways that vary by cultural context and agro-environment. We use a choice experiment to estimate the farmers' valuation of three components of agrobiodiversity: crop species richness, maize variety richness and maize landraces. We include the option to cultivate genetically modified (GM) maize. Data were collected from 420 farm households across three states of Mexico. We analyze the heterogeneity of farmer preferences with a latent class model, which enables us to identify the characteristics of farmers who are most likely to continue growing maize landraces, as well as those least likely to accept GM maize. Findings have implications for debates concerning the use of GM maize in Mexico and the design of on-farm conservation programmes.

Session 23

Valuation

An empirical estimation of the opportunity costof time for visitors to Gros Morne National Park

by
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In this paper we apply the individual travel cost method to estimate the value of trips to Gros Morne National Park. We use count data models that account not only for the truncated and overdispersed nature of the distribution of the dependent variable but also for endogenous stratification due to the oversampling of avid users resulting form the on-site sampling. The focus is on the proper estimation of the opportunity cost of travel time as part of the overall cost of the trip. The fraction of hourly earnings that corresponds to the opportunity cost of travel time is endogenously estimated for each visitor as a function of visitor characteristics, rather than .xed exogenously. The analysis reveals that in this application the relevant opportunity cost of time for most visitors represents a smaller fraction of their wage rate than what is commonly assumed in the literature.

Modeling of Income Effects on Biodiversity for Proper Global Policies

by
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This paper attempts map changing pattern of impacts of export promotion for biodiversity and attractions of international tourists from biodiversity under globalization constructing theoretical models proved by analysis of empirical data sets. The results were compared with existing economic theories and highlight qualifications and disqualifications of existing theories in application for this case. The study discovered theories, facts and new analytical methods, which will nourish future research directions. For export promotion, Kuznet curve was reached and for recreation arrival rates, GDP-ppp per capita, Biodiversity, and other more variables were modeled. The correlation between arrival rate and per capita income violates absolute income theory of consumption. Finally this paper demonstrates that non-linear correlation exists between arrival rate and GDP-ppp per capita among countries, and also arrivals and Biodiversity are interdependently correlated. Moreover, this paper proves that conservation of more biodiversity by means of parks, sanctuaries and different kinds of reserves in developing countries is the better option than converting for export agriculture for maximizing global welfare.

Session 24

Information and Genetic Resources

Legal and practical issues of the emerging principle of Free Prior Informed Consent for protected area management

by
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Free Prior Informed Consent (FPIC) it will be argued, is an emerging principle of international environmental law that will play an important role in the ongoing development and management of protected areas (of all categories) for biodiversity conservation. The 'operationalisation' of this principle requires a good understanding of the growing body of international law concerned with indigenous peoples land rights, self determination and human rights, and this is presented in the first section of this paper. However knowledge of the present state of international (and national) law where appropriate does not in itself give a guide to the practical application of the concepts. The second section of this paper will therefore examine some of the practical issues that come to the fore when the legal principles are put into practice, often in countries with limited resources. The urgency for a more practical debate is highlighted by the Convention on Biological Diversity (CBD) decisions on Protected Area Management and Access and Benefit Sharing. The paper will conclude by examining the issue of compliance with FPIC in the work of biodiversity conservation agencies, and related bodies, at global, regional and international levels.

Biotechnologies, Seeds & Semicommons

by
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The paper applies the framework of semicommon property arrangement to analyze the effects of the expansion of property rights in the development, exchange and conservation of crop genetic resources. Strong intellectual property rights have emerged to protect investments of private breeding sector in crop development while national sovereign rights over plant genetic resources have been established at the international level. The new international regime should provide effective incentives for the sustainable use and conservation of crop genetic resources, but it may be ill suited in a field where 1) crop development is a cumulative process based on a networked environment of innovators and 2) traditional farmers and public institutions are still relevant stakeholders in crop development sector. The understanding of crop genetic resources management as a semicommons may help to unveil normative prescriptions in order to avoid the distort effects of the enclosure. New institutional devices, which guarantee access to germplasm among traditional farmers and the public agricultural research system, may limit the distortions caused by the expansion of exclusion rights. The new FAO Treaty (signed in 2001), which sets up a multilateral system of facilitated germplasm exchange and affirms the concept of Farmers' Rights, may be considered an institutional mechanism that shares this policy vision.