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Migration and remittances as means of adaptation to
climate change and natural disasters

Deforestation, low - carbon cities, economic valuation,
biofuels, payments for ecosystem services, poverty
alleviation and the environment, international trade,
environmental treaties, water management...



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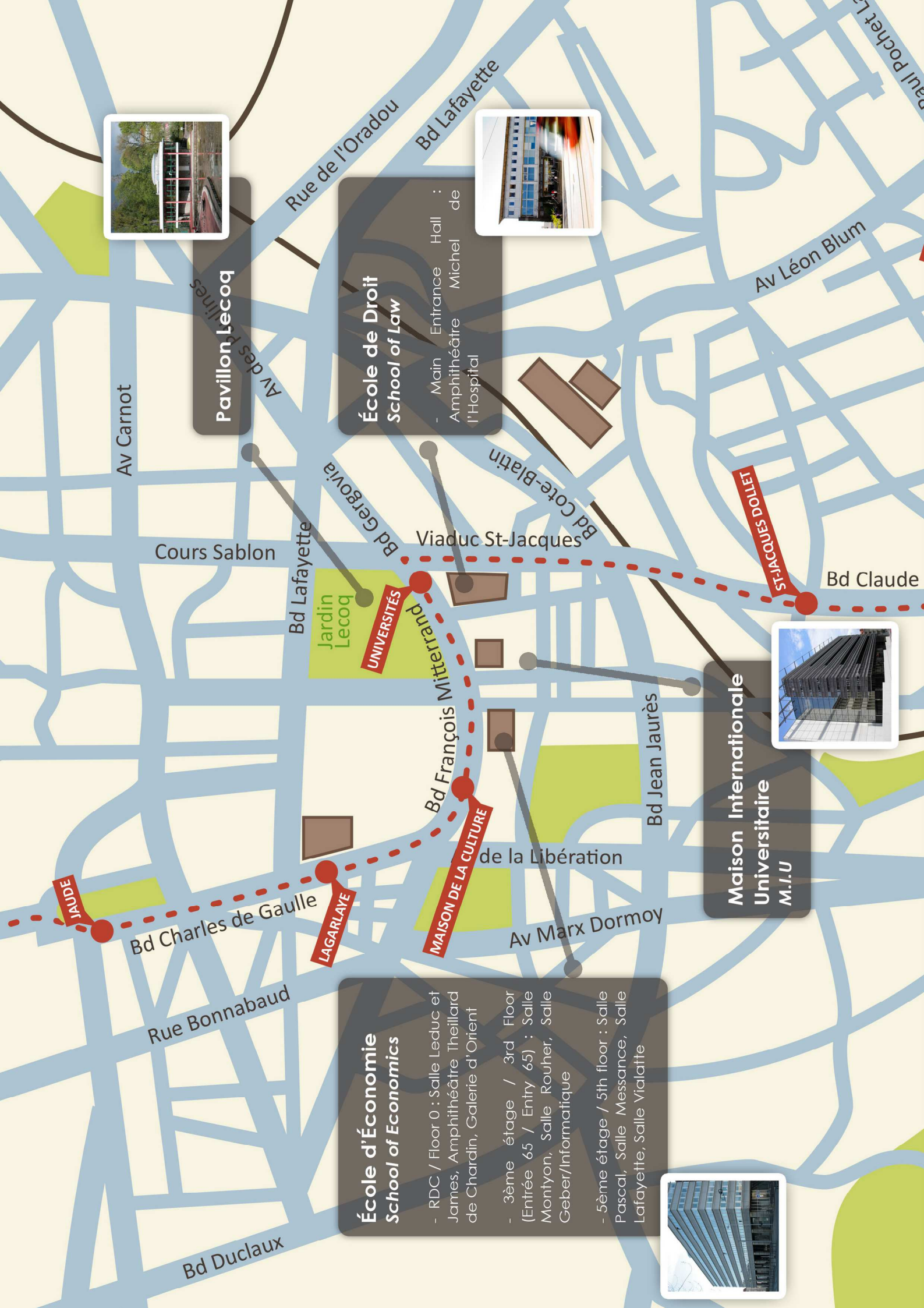


Table of Contents

Wednesday, October 17, 2012 - 11:30 - 13:00

Michel de l'Hospital : Migration and the Environment

Climatic Factors as Determinants of International Migration, M Beine [et al.]	1
The role of remittances in African countries facing climate variability: a Panel VAR Approach, R Generoso [et al.]	2
Addressing Climate Change and Migration in Asia and the Pacific. Final Report, F Gemenne	3

Wednesday, October 17, 2012 - 15:30 - 16:30

Michel de l'Hospital : Migration and the Environment

Climate Variability and Internal Migration: A Test on Indian Inter-State Migration, I Dallmann [et al.]	4
Weather Variability, Agriculture and Rural Migration: Evidence from State and District Level Migration in India, B Viswanathan [et al.]	5

Wednesday, October 17, 2012 - 16:45 - 18:15

Michel de l'Hospital : Migration and the Environment

Climate Change, Agricultural Productivity, and Internal Migration in Pakistan, H Lohano	6
Climate Change and Migration How does climatic change influence the decision to migrate?, P Guillaumont [et al.]	7
Introducing the 'Where the rain falls' Project, A Milan [et al.]	8

Thursday, October 18, 2012 - 09:35 - 11:05

Teilhard de Chardin : Growth and the Environment

Longevity, pollution and growth, N Raffin [et al.]	10
Optimal Public Policy in a Schumpeterian Model of Endogenous Growth with Environmental Pollution, M Mehra [et al.]	11
Urbanization and Growth in the Brazilian Amazon, S Castelani [et al.]	12

Lafayette : Energy

Optimal Switching to Clean Production Technologies, N Vardar	13
The CO2 Reduction Effects and Climate Benefit of Beijing 2008 Summer Olympics Green Practice, D Wu [et al.]	14
Biofuel Development and Large-Scale Land Deals in Sub-Saharan Africa, E Ticci [et al.]	15

Montyon : Biodiversity

How Much is Too Much? Individual Biodiversity Conservation vis-a- vis Socially Optimal Levels, M Bezabih [et al.]	16
Ecotourism and Public Good Destruction: A demand-side approach, L Weidert [et al.]	17
Classifying Market-Based Instruments for Ecosystem Services: A Rough Guide to the Literature Jungle, R Lapeyre [et al.]	18

Pascal : Health

Valuing access to water in Rwanda : a hedonic approach, C Uwera [et al.]	19
Understanding health penalty of urbanization in poor households in Nigeria, S Adewara [et al.]	20
Willingness to Pay for Mortality Risk Reduction and Age: Evidence from a Choice Experiment Survey in Beijing, D Huang [et al.]	21

Thursday, October 18, 2012 - 11:30 - 13:00

Teilhard de Chardin : Energy

Decomposition of aggregate energy intensity changes in Tunisia over the period 1980-2007, M Fodha [et al.]22
A decomposition analysis of air pollutants in the Czech Republic, F Menkyna.....23
Auctioning CO2 Permits in the Czech Republic: Expected Sectoral and Overall Economic Effects, L Lizal.....24

Lafayette : Agriculture and the Environment

Environmental and Economic evaluation of Sustainable technology adoption by poor farmers in a developing country -A micro level evidence from India, A Pouchepparadjou [et al.] 25
Climatic Shocks and Food Security in Developing countries, S Kinda [et al.] 26
Social Changes and the Gender-Environment Nexus in Contemporary Rural China: Evidence from an Inner Mongolian Village, Y Hu..... 27

Montyon : International Environmental Agreements

The effect of electoral cycles on international environmental agreements ratification, A Sauquet [et al.]28
Toward a Framework for Implementation of Climate Change Treaty through Self-enforcing Mechanisms, M Mehra [et al.] 29
.....
An Economic Aanalysis of the Andean Community Biodiversity Governance Coalition, S Winands.....30

Pascal : Water

Estimation of non-tap water demand for connected and non-connected households in urban districts of Rwanda, C Uwera 31
.....
Analysis of households demand in improved sanitation: the case of ecological latrines in Dapaong city in northern Togo, A Loyal lare..... 32
Water Affordability and Social Equity in Tunisian Governorates: A distributive approach, M Sebri..... 33

Thursday, October 18, 2012 - 15:15 - 16:45

Montyon : Agriculture and the Environment

The environmental efficiency of organic farming in developing country: a case study from China, H Guo [et al.]34
Providing organic farming products at different spatial scales: Insights from Economics, T Chloé [et al.]35
Assessing the Impact of El Niño Southern Oscillation on Brazilian Agriculture, J Feres [et al.]36

Lafayette : Climate Change Adaptation

Economics, Institutions and Adaptation to Climate Change, C Oberlack [et al.] 37
Weather insurance for members of groups with common interests, V Dequiedt..... 38
Adaptation to Climate Change and Climate Variability: Do It Now or Wait and See?, D Narita [et al.] 39

Thursday, October 18, 2012 - 15:15 - 16:55

Teilhard de Chardin : Natural Resources Management

International Investment, Institutions, and Resource Valuation: Evidence from the Global Petroleum-Reserves Market, R Click [et al.]40

Extracting Oil, Gas and Minerals: Institutions, Violence and Sustainability in Developing Countries, N Wagner [et al.]	41
The resource curse in Peru, C Cantuarias [et al.]	42
Optimum Commodity Taxation with a Non-Renewable Resource, J Daubanes [et al.]	43

Thursday, October 18, 2012 - 17:10 - 18:40

Teilhard de Chardin : International Environmental Agreements

Determinants of unilateral Clean Development Mechanism project registration: an empirical analysis, G Schmid.....	44
Border carbon adjustment and potential trade retaliation: an evaluation with MIRAGE-e, S Monjon [et al.]	45
North-South Contractual Design through the REDD+ scheme, S Roussel [et al.]	46

Lafayette : Water

Economic Valuation of Water in Agriculture ? A Case Study of Madurantakam Tank in Tamilnadu, J Sindhu.....	47
Water scarcity and conflict - a reciprocal problem?, H Ritter.....	48
Arab Sovereign Wealth Funds and Investments in Land and Water in Sub Saharan African Countries, R Bertini.....	49

Montyon : Natural Resources Management

Fishery Resources and Trade Openness: Evidence from Turkey, B Bayramoglu.....	50
The Response of Fishermen to Fishing Control Policies in Southern Songkhla Lake, Thailand: A Field Experiment, K Pornpinatepong [et al.]	51
Open Access vs Exclusive Access With Two Variable Factors, R Congar [et al.]	52

Pascal : Forests

Payments for Environmental Services can enhance Community Forest Enterprises development, C Muñoz-piña [et al.] ...	53
Rural Poverty, Livelihood Strategies and contribution of Biomass to Household Economy: Panel Data Evidences from Ethiopia, D Guta [et al.]	54
From Global to Regional Model: an Empirical Assessment on Tropical Deforestation Drivers, G Pallante [et al.]	55

Friday, October 19, 2012 - 08:30 - 10:30

Teilhard de Chardin : Valuation

Improving Solid Waste Management in the Island of Beauty (Corsica): a Rank-Ordered Logit Approach with Observed Heterogenous Ranking Capabilities, O Beaumais	56
Private Pay or Public Pay? A Choice Experiment Study on Air Pollution Related Health Valuation, X Xie [et al.]	57
Road Project Opportunity Costs Subject to a Constraint on Greenhouse Gas Emissions, J Martin [et al.]	58
Contingent valuation for a better air quality: the case of car pollution in Quebec and France, T Poder [et al.]	59

Pascal : Forests

Sustainability in the Amazon: do booms in deforestation lead to busts in development?, D Weinhold [et al.]	60
Public expenses, credit and natural capital: Substitution or complementarity?, P Motel combes [et al.]	61
Dynamics of Indirect Land-Use Change: Empirical Evidence from Brazil, S Andrade de sá [et al.]	62
Development and land use in developing countries: an empirical analysis of the cumulative nature of both deforestation	

and agricultural expansion, J Wolfersberger [et al.]	63
Montyon : Energy	
EU Biofuel Policies and The Regulation of Indirect Land Use Change, M Lange [et al.]	64
Emerging Innovation system and Environmental Innovation: the case of CCS and BCCS., X Galiegue.....	65
Energy as a driver of growth in oil exporting countries?, S Majda.....	66
Food for Fuel: Does U.S. Energy Policy Increase Poverty in India?, M Hubert.....	67
Friday, October 19, 2012 - 11:00 - 13:00	
Pascal : Growth and the Environment	
The environmental Kuznets curve for deforestation: a threatened theory? A meta-analysis, J Choumert [et al.]	68
Impact of urbanization on national residential energy use and its implications for climate change: Evidence from a panel data analysis, P Poumanyvong.....	69
Environmental Kuznets Curve and Ecological Footprint: A Time Series Analysis, O Darne [et al.]	70
Sustainable Development Measurement: Change in Wealth and Change in Consumption, G Yacouba.....	71
Teilhard de Chardin : Forests	
Ecological inequalities, poverty and forest income: a case study from Burkina Faso, S Ferrari [et al.]	72
Commons as insurance: theoretical predictions and an experimental test, P Delacote [et al.]	73
Land Inequality and Deforestation in the Brazilian Amazon, A Sant'anna.....	74
Land use change (LUC) and Socioeconomic Development in Brazil, M Lange.....	75
Lafayette : Energy	
Energy Efficiency and Split Incentives in the Residential Sector: The Tenant Landlord Problem, D Charlier.....	76
Environmental policies and innovation: the role of an Agent-Based Model in the propagation of renewable energies, S Bontempi [et al.]	77
Household Fuel Use in Rural China, H Yan.....	78
Electricity (in) efficiency in transition economies: evidence from a firm's survey, B Najman [et al.]	79
Montyon : Competitiveness & the Private Sector	
A dynamic model for weak sustainability, L Dupuy.....	80
Democracy, inequality and the environment when citizens can mitigate privately or act collectively, L Hotte [et al.]	81
The carbon embodied in the bilateral trade between China and Canada and China-France: What would have been the efficiency of Kyoto Protocol?, J He [et al.]	82
Sustainable development and industrial Ecology: The success story of Industrial Symbiosis, A Diemer.....	83

Climatic Factors as Determinants of International Migration

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In this paper, we examine environmental change as a potential determinant of international migration. We distinguish between unexpected short-run factors, captured by natural disasters, as well as long-run climate change and climate variability captured by deviations and volatilities of temperatures and rainfall from and around their long-run averages. We start from a simple neo-classical model, which is augmented to include environmental change at origin in the form of amenities. We then test the model using a panel dataset of bilateral migration flows for the period 1960-2000, the time and dyadic dimensions of which additionally allow us to control for numerous time-varying and time invariant factors. Using our primary specification, having accounted for other well documented determinants of migration, we find no direct impact of climatic change on international migration in the medium to long run across our entire sample. These results are robust when further considering migrants returning home. Further conditioning our regressions upon origin country characteristics, we find evidence that shortfalls in precipitation constraint migration from developing countries which rely more heavily upon agriculture and spur movements from developing countries with fewer groundwater reserves. We further use the rate of urbanization as a proxy for internal migration and find strong evidence that natural disasters beget greater flows of migrants to urban environs.

The role of remittances in African countries facing climate variability: a Panel VAR Approach

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The aim of this paper is to assess the role of remittances in West African countries facing climate variability. In particular, we attempt to answer the question of whether remittances respond to rainfall shock and how this adjustment affects macroeconomic performance of those countries. Accordingly, we estimate a panel VAR for a sample of eight West African countries over the period 1980 to 2009. Rainfall variability is found to impact negatively economic activity and positively remittances. Remittances tend in turn to increase agricultural imports especially in the countries most vulnerable to precipitation variability.

Addressing Climate Change and Migration in Asia and the Pacific. Final Report

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This report marks the conclusion of an ADB-financed technical assistance project launched to generate policy responses to migration stimulated by climate-related factors. It represents the first significant effort to identify policy and other responses to impacts of environment events on human mobility within the Asia and Pacific region.

Climate Variability and Internal Migration: A Test on Indian Inter-State Migration

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We match data from the Indian census of 1991 and 2001 with climate data to test the hypothesis of climate variability as a push factor for internal migration. Gravity model estimations cannot reject the null hypothesis of the drought event frequency acting as a push factor on inter-state migration in India. The magnitude and the duration of the drought events seems to be less important in determining the interstate out-migration. When significant, though, drought frequency consistently has a much smaller effect than ratios of scheduled castes or tribes in the population but, surprisingly, a comparable marginal effect on income per capita.

Weather Variability, Agriculture and Rural Migration: Evidence from State and District Level Migration in India

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This study explores the three way linkage between weather variability, agricultural performance and internal migration in India at state and district level. The state level analysis focuses on inter-state out-migration using 1981, 1991 and 2001 Census data, while the district level analysis focuses on inter- and intra-district in-migration using 2001 Census data. The migration data from each Census is based on two reporting periods (durations of stay); rice and wheat yields are used to assess agricultural performance; and weather variability is captured through annual and seasonal temperature and rainfall. All the analyses are based on 2SLS estimation for panel data. Results from the state level analysis suggest that a ten percent increase in wheat and rice yield decreases rural out-migration rate by 0.04 and 0.07 percent respectively. The elasticity of migration rate with respect to per capita net state domestic product is about (-)0.75. In comparison to this the crop-wise analysis shows that the (negative) elasticities are far higher and more substantial for rice (-1.85) than for wheat (-0.90). The district level analysis show much larger magnitudes of estimated change in migration rates to relative change in crop yields. However, the direction of response of migration to the yield change is opposite for two crops considered. Increase in wheat yields lead to increase in rural in-migration rates, and increase in rice yields lead to decrease in rural in-migration rates. These differences are explained through possible interaction between inter- and intra-district movements that constitutes the in-migration data reported in the Census.

The study findings could have significant policy relevance especially in the context of global climate change and the prospect of migration serving as a potential adaptation strategy.

Climate Change, Agricultural Productivity, and Internal Migration in Pakistan

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This study examines the impact of climate-driven changes agricultural productivity on internal migration in Pakistan. The study uses the panel data model with two-way error components for the disturbances that accounts for cross-section specific effects and time period effects. Panel data used in this study are district-level data for four time periods 1971-76, 1976-81, 1988-93, and 1993-98, and for 50 districts of Pakistan, obtained from Census Reports of Pakistan and other government publications. The panel data model is estimated by the two-stage least squares method with climate variables used as instrumental variables. This method allows us to identify the changes in migration associated with changes in agricultural productivity resulting from climate change. Results for immigration show that the changes in agricultural revenue productivity resulting from climate change have significant impact on internal migration.

Climate Change and Migration How does climatic change influence the decision to migrate?

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Climate change is likely to impact international migrations. While most studies assess the surprisingly small impact of natural disasters, climatic shocks, or climatic levels on migration, we assume that the long run trends of climatic variables, or structural changes, may play a bigger role in migrants' decisions. The study relies on the indicator of physical vulnerability to climate change designed and computed by Guillaumont and Simonet (2011). This indicator has different components: flood, temperature, sea level, rainfalls variability, and we aim at disentangling how those different components influence both the decision to migrate and the choice of the destination country.

Introducing the 'Where the rain falls' Project

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Changing weather patterns, which include less predictable seasons and increasingly erratic rainfall, are some of the most important but least understood impacts of global warming. The Where the Rain Falls (Rainfalls) project, undertaken in partnership between the United Nations University Institute for Environment and Human Security (UNU-EHS) and CARE International, seeks to better understand the relationship between rainfall patterns, food security and human mobility.

The project has three objectives:

1. To understand how rainfall variability, food and livelihood security and migration interact today;
2. To understand how these factors might interact in coming decades as the impact of climate change begins to be felt more noticeably;
3. To work with communities to identify ways to manage rainfall variability, food and livelihood security and migration.

The project investigates the following three questions (related to the three research objectives above):

1. Under what circumstances do households use migration as a risk management strategy in response to increasing rainfall variability and food insecurity today?
2. Under what scenarios do rainfall variability and food security have the potential to become significant drivers of human mobility in particular regions of the world in the next two to three decades?
3. In the context of climate change, what combination of policies can increase the likelihood that human mobility remains a matter of choice among a broader range of measures to manage risks associated with changing climatic conditions, rather than «merely» a survival strategy after other pathways have been exhausted? The project explores such policy alternatives in hotspot areas of the world.

Field research was conducted at the local and district level in eight countries (Bangladesh, India, Guatemala, Peru, Ghana, Tanzania, Thailand and Viet Nam) in order to answer question one. Field research methods included:

Participatory Research Approaches (12 PRA tools used, including a range of mapping, diagrams, focus group discussions and other group exercises) Household survey (a total of more than 1,300 surveys completed across the eight countries) Interviews with experts from governmental and non-governmental organizations, scholars and other experts, as well as problem-centered in-depth interviews with experts on the topic of rainfall variability, food and livelihood security, and human mobility

The Peruvian case study was conducted in the sub-basin of the Shullcas River, Department of Junín (in the central Andes), in a mountainous region with the presence of snow peaks such as the Huaytapallana (5,557 masl) which are of interest to the project researchers given the process of rapid deglaciation of which they are suffering. In particular, three communities belonging to the sub-basin (and its surroundings, in the case of Paccha) were selected.

In the research area, agricultural activities take place between 3,200 and 4,800 masl, resulting in different ecological zones known as Quechua (2,500-3,500 masl), Suni (3,500-4,000 masl), Puna or Jalca (4,000-4,800 masl), and Cordillera or Janca (over 4,800 masl). As one moves up in altitude, the weather becomes more severe, with frosts, hail, a marked rainy weather season (November to March) followed by the dry season, all of them with great variability that creates uncertainty and puts harvests at high risk. The multi-year average annual rainfall is 750 mm, with minimum temperature between 0.1 and 20C. With an approximate length of 35.9km, the Shullcas River gives rise to a narrow valley that runs from the foothills of the Huaytapallana peak in the area of highest elevation, until the Mantaro River in the lowest area, on the east side

of the city of Huancayo.

The rural populations, mainly engaged in family farming in small plots, have seen increased risks on their crops, and thus, the deterioration of their income and food security. One of the main responses that rural populations use to combat climate uncertainty and production risks is daily mobility to the urban area of Huancayo, as well as migration to urban areas both within Peru and outside the country. This study investigates these issues in greater depth.

Two types of livelihoods could be distinguished within the research area, one associated with lowland communities near the city of Huancayo, and the other with those in the highlands. The lower ecological floor is characterized by farmers with small land holdings. Due to their proximity to the city of Huancayo, they heavily rely on daily mobility to the urban area and the main climatic threats to their livelihood are drought and insufficient rain. Populations living in the higher ecological floor are often shepherds. Because of their lower access to the city of Huancayo, they tend to migrate for few years or permanently to Lima or outside of Peru, rather than commute daily to Huancayo. The main climatic threat to their livelihood is frosts.

The results of this study show that changes in precipitation patterns, especially the shortening of the rainy season, are making farming activities riskier, and thus, not allowing farmers to plan their agricultural activities as they used to do a few decades ago. Rainfall variability has a direct effect on livelihood and food security, as it hinders the production of food, especially in the higher altitude areas where a higher share of the population depends on farming activities. Moreover, rainfall variability plays an indirect but relevant effect on migration decisions.

Longevity, pollution and growth

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In this paper, we develop an OLG model where both longevity and fertility are endogenous. The authorities provide two types of public expenditures: health services and environmental maintenance that participate to increase agents' life expectancy. Under proper conditions on the fiscal policy implemented by the government, the global dynamics is featured by multiple equilibria: a high growth rate, associated with longer life expectancy and a reduced fertility, and a poverty-environment trap. On the other hand, if the environmental tax rate is too large, the economy collapses. We also show that an ambitious environmental policy might enhance the growth rate of economy depending on the technological characteristics, for instance the efficiency of cleaning activities. Finally, we are able to draw conclusions on the nature of complementarity between the two policy instruments.

Optimal Public Policy in a Schumpeterian Model of Endogenous Growth with Environmental Pollution

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The paper utilizes a model of endogenous growth with vertical innovation (a la Aghion-Howitt) to examine how the inclusion of a production related pollution externality affects the prospect for long-run growth of a closed economy. It is derived that the social optimum exhibits the possibility of long-run sustainable growth, such that consumption, capital stock and output grow without bound, knowledge also grows in an unbounded fashion, and both -- the intensity and stock of pollution -- fall. In comparison, at the unregulated market equilibrium, a clear conflict arises between sustaining economic growth and environment protection, as growing pollution stock ceases the opportunity for long run growth in output, capital stock and consumption. Finally, in deriving the optimal public policy tool-kit, given the distortions in the unregulated market economy, it is shown that a positive and growing rate of tax on pollution, an ad valorem subsidy on capital and a positive R and D subsidy would implement the socially desirable outcome. However, a theoretical possibility of an optimal tax on R and D cannot be ruled out in an exceptional situation of too low a productivity of the R and D sector.

Urbanization and Growth in the Brazilian Amazon

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In this article we investigate the increasing urbanization process happening in Brazilian Amazon. We first illustrate the high intensity by which this process is going on the region, and then explore how this urbanization process is related to economic growth, regional development and individual well-being, as urban economics models would predict. To do so, we first provide preliminary statistical results on the relationship between social development and urbanization, and the results indicate that the highly urbanized centers, including a few which belong to dense metropolitan areas, are also the ones that show greater HDI indexes, and vice versa, corroborating theoretical models in which individuals migrate to cities in search of better living conditions. Then, we make use of spatial econometric methods, such as the GS2SLS estimators developed by Arraiz et al (2010) and Kelejian & Prucha (2007), to try to determine how this urbanization process affect economic growth. Again, our results go along with urban economics theory, for they point that over the last decade, GDP per capita and employment grew faster in cities located within metropolitan areas, or in which the urban population share of the EAP was higher and transportation costs to the nearest capital were lower. Still, relationships with external markets, such as São Paulo and exports to other countries, also proved to be important drivers to economic growth. Thus, our evidence suggest that economic growth and development in Brazilian Amazon seem to be a partially increasingly endogenous process, due to the growing urbanization, but still partially related to external drivers.

Optimal Switching to Clean Production Technologies

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The remarkable increase of energy usage in recent decades resulted as economic and environmental problems. These problems led several multi-disciplinary research ongoing for alternative energy resources. However, even though there exist several renewable energy technologies, the economies might not start to use them intensively because their usage requires some specific infrastructure, physical and human capital which have extra costs. International and national policy makers should take into account these facts in order to induce the economies to switch. We develop a benchmark model which will cover the economic facts about switching to clean production technologies. Our results showed that there does not exist a steady state and also there does not exist a balanced growth path in the issue of switching to new technologies. In order to find optimal paths, we conducted simulations and we found that in the short run the economy will use the non-renewable energy increasingly while it is gradually allocating resources to clean production technologies. In the medium run, restructuring of the production structure will result as a recession while in the long run there will be rapid growth and intensive use of clean production technologies. We also found that the substitutability between dirty and clean technologies and the price of renewable energy are the key factors which determine the switching process.

The CO₂ Reduction Effects and Climate Benefit of Beijing 2008 Summer Olympics Green Practice

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Currently, China faces both the challenge of mitigating the CO₂ emissions in coping with global climate change and abating air pollutants emissions in dealing with domestic environmental stresses. Although there being on-going discussions, it is still not clear for China that how to integrate greenhouse gas abatement into air pollution control policy framework now. In this study, we try to estimate CO₂ reduction by major greening Olympic measures for 2008 Beijing Olympic Games, aiming to provide evidence on curbing CO₂ emissions as a co-benefit for improving local air quality by mega-events. CO₂ emission reduction by three types of measures has been estimated including: energy related measures, transport management, and temporary air pollution control measures. As estimated, from the perspective of long-term effect, the measure of clean energy substitution and improving energy efficiency and application of advance energy saving technologies would be cost-effectiveness measures for China addressing both air pollution control and green-house gases abatement. We suggest China government integrate CO₂ reduction to local air quality improvement policy framework, and take mega-events as triggers for more sustainable urban development.

Biofuel Development and Large-Scale Land Deals in Sub-Saharan Africa

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Traditional biomass is the main source of energy in Sub-Saharan Africa, but biofuels are regarded as a more efficient form of carbon-based energy that might play a crucial role to tackle the persistent energy crisis in the continent. Africa's biofuel potential is receiving a growing attention by foreign investors, as revealed by the recent wave of large farmland investments. With the help of quantitative data and qualitative information from different sources, we discuss the main trends, limits, potentials and risks of biofuel development in Africa and we use zero-inflated Poisson specifications of the gravity model to estimate determinants of transnational land acquisitions for biofuel production. We find that some features of biofuel development in the continent raise concerns on its equity and sustainability. The sector is specialized in first-generation biofuel; large plantations financed by export-oriented foreign corporations are the prevailing farming system; biofuel investments are closely linked to large scale farmland acquisitions; actual start-up of production does not always follow the investments, and in some cases technical, financial and implementation difficulties undermine social and economic viability of biofuel projects. Furthermore, our econometric estimates suggest that land availability and abundance of water resources combined with weak land governance are among the main drivers of land acquisitions for biofuel production in Sub-Saharan Africa

How Much is Too Much? Individual Biodiversity Conservation vis-a- vis Socially Optimal Levels

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The individual farmer in a developing country has little incentive to care about the public good properties of on-farm biodiversity in the form of different crop varieties. There is a common assumption that because of this, farmers will tend to maintain too little biodiversity on their farms. However, this does not fit well with the empirical data; because of poorly functioning insurance markets, farms tend to maintain a wide range of different crop varieties in practice in order to hedge against weather shocks and other uncertainty. In this paper we develop a theoretical model to account for this, and show that farmers may in fact even maintain too much biodiversity on the individual farm, compared to the social optimum. This will be illustrated with empirical estimations from Ethiopian agriculture.

Ecotourism and Public Good Destruction: A demand-side approach

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In 2011, international tourism has generated US\$ 1.2 trillion in export earnings, making the industry one of the most profitable ones worldwide. Particularly the green market of tourism, i.e. ecotourism, witnesses increasing popularity among both demanders (tourists) and suppliers (firms operating in developing countries). This paper adds to the research literature in two ways: First, we develop a model of the tourism sector with mass tourism and eco-tourism to highlight ecotourism from the demand side instead of from the supply side. Second, as ecotourism bundles tourism services with biodiversity conservation, we show when conservation policies fail to improve biodiversity protection. Moreover, conservation policies can be welfare-immiserizing, depending whether tourism services and biodiversity conservation are perfect substitutes for or perfect complements to one another. This paper adds to the research literature in two ways: First, we highlight ecotourism from the demand side instead of the supply side. In the research literature on ecotourism, a firm often faces a decision to either conserve a piece of land or to convert it for agricultural purposes. However, eco-tourists more often visit national parks, scarce lands declared as protected by the government. With this fact, eco-tourists generate a public good by means of paying entrance fees in order to sustain biodiversity conservation. Consumers rather than producers provide for biodiversity conservation. Second, by using an impure public good model we show that the technology with which the private characteristic is generated determines the level of overuse and increases biodiversity destruction instead of conservation.

Classifying Market-Based Instruments for Ecosystem Services: A Rough Guide to the Literature Jungle

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Although market-based instruments (MBIs) gained prominence in discourses and practice in the field of biodiversity conservation and provision of ecosystem services, their definition and underpinning theory are yet unsettled matters. A review of MBIs – including Payments for Environmental Services, taxes and subsidies, mitigation or species banking, certification, etc. – clearly shows that this label encompasses an extremely diverse array of instruments. Their only shared characteristic might be that monetary values are associated with nature, yet in different ways and not necessarily in conjunction with economic valuations of the benefits / impacts associated to biodiversity and ecosystem services. Their links with markets are often loose, at least contrasted if not questionable in many cases, and the nature of «markets» differs dramatically. This pleads for a better and theory-based typology of such a large collection of policy instruments in order to better inform policy making. The proposed typology is based on the links between MBIs, economic theory, and markets. It includes six generic categories: regulatory price changes, Coasean-type agreements, reverse auctions, tradable permits, direct markets, and voluntary price signals. `<?xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />`

Further analysing an extensive review of academic articles on MBIs (146 references found on Web of Science with selected keywords, and 106 references eventually deemed relevant), we attempted to see if our theoretical categories of MBIs were well reflected in the scientific literature and if some policy lessons could be drawn. We found that the proposed typology could prove useful to classify existing instruments; nevertheless, the analysis of the literature on MBIs also revealed the great diversity in research methods and evaluation criteria, as well as in the terminology used. This lack of a common theoretical and empirical framework in the scientific corpus prevents practitioners to draw robust policy-relevant results on MBIs and thus calls for further research and harmonisation of methods to be applied to better defined categories of MBIs with key shared characteristics.

Valuing access to water in Rwanda : a hedonic approach

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In this paper, we study the determinants of rental values in urban housing markets in Rwanda. We put particular emphasis on the value of access to piped water; due to the high costs associated with installing new piped connections, renting a property with an existing connection is often the only way for low income households to access piped water. Our results indicate that expanding the piped network to a new neighborhood will in many cases raise the value of the properties in the neighborhood by more than the cost of installing the new infrastructure.

Understanding health penalty of urbanization in poor households in Nigeria

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Until recently, the general perception is that child health outcomes are better in urban than in rural areas in sub-Saharan Africa. Due to this general perception, previous efforts on health are focused on children in the rural areas. However, the 2012 UNICEF state of the world children report shows that children in most of the urban areas across the globe are facing greater health risks associated with urbanisation. In Nigeria, about 50 percent of the over 160 million people in the country live in urban areas. In this paper, we first used concentration index to determine the magnitude and direction of change in rural-urban disparity in child nutritional status measured by height for-age z-scores between 1999 and 2008 in Nigeria. Secondly, we adjust the gaps in children health outcomes for differences in rural and urban population characteristics. We used concentration index to measure socioeconomic health inequality and Blinder-Oaxaca decomposition was used to determine the degree of health inequality between the rich and the poor in the urban and rural areas. Our results show that childhood malnutrition measured by negative height for-age z-scores persisted and even deteriorated to the disadvantage of children in poor urban households. The result further that gaps maternal and paternal level of education, gaps in maternal heights and geo-political variations are the main causes of the prevalence of stunting amongst poor children in both rural and urban areas in Nigeria. We therefore argue that urbanization without concerted efforts to reduce existing gaps in the determinants of health outcomes does not benefit the poor.

Willingness to Pay for Mortality Risk Reduction and Age: Evidence from a Choice Experiment Survey in Beijing

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Proposals to apply lower values to risk reductions for older adults have drawn attention to the theoretical and empirical studies describing the relationship between the willingness to pay for mortality risk reduction, termed as the value of statistical life (VSL), and age. Since it is an important issue in health economics and environmental economics, this paper adds new insights to the issue discussed in lots of literature, presenting the results of a choice experiment survey in Beijing. About 500 residents involve in this face-to face survey with and make an individual choice from different air quality and health improving programs, of course including the status quo as the baseline, and the Multinomial Logit Model is used to estimate the VSLs of three age groups of younger, middle-aged and elder people. The results show an inverted U-shaped relationship of VSL and age and the evidence of «senior discount.» VSL of elders is lower than the middle-aged people, but a bit higher than that of the younger group. In addition, we also find a similar inverted U-shaped relationship between age and willingness to pay for morbidity risk reduction, termed as the value of statistical illness (VSI). This paper provides an evidence of the relation of VSL/VSI and age with choice experiment survey for the first time in china, as the new perspective in the less-developed country.

Decomposition of aggregate energy intensity changes in Tunisia over the period 1980-2007

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This paper investigates the main factors that contribute in the decline in aggregate energy intensity of the Tunisian economy, during the period 1980-2007. We decompose the total changes in energy intensity into inter-fuel substitution effects, technological effects and structural effects at two levels of sectoral disaggregation using the Logarithmic Mean Division Index (LMDI) decomposition method. Our results show that the main contributor to the decline in energy intensity of the Tunisian economy is the technological change. This result was confirmed when we decomposed the energy intensity change of the industry and service sectors. However, inter-fuel substitution effects actually increasing energy intensity and the structural effects are almost relatively neutral over the entire period.

A decomposition analysis of air pollutants in the Czech Republic

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We statistically decompose the change in the emission level of the various pollutants such as SO_x, CO, NO_x, VOC, and particulate matters (PM) in the Czech Republic. First, we decompose the emission level in 1995 - 2007 into three factors: emission intensity effect, scale effect, and composition effect. We find that the implementation of command and control types of law, which required the large sources of emissions to satisfy emission limits until 1999, were highly effective in the reduction of the emission level of SO_x, NO_x, CO, and PM. Moreover, the reduction was mainly induced by a change in the emission intensity effect, which captures the change in environmental efficiency relative to the per capita GDP. Secondly, we further decompose the emission intensity effect into three factors (1) a fuel intensity effect (2) a fuel mix effect, and (3) an emission coefficient effect. We find that the emission coefficient effect is the most prominent factor, especially during the period of 1995-1999. In other words, command and control regulation motivates firms to decrease their emission levels by improving abatement technology, represented by the end-of-pipe technology, not by changing fuel usage.

Auctioning CO2 Permits in the Czech Republic: Expected Sectoral and Overall Economic Effects

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This paper estimates the overall and redistribution effects of a change from a current free CO2 permit allocation scheme to a new auction system. The EU efforts to curb greenhouse gas emissions, especially CO2, have materialized in the proposed amendment of Directive 2003/87/EC. The existing Emission Trading System (ETS) which will be in effect till 2012 should be gradually replaced with an auction system. We show the redistribution impact is not severe; however, this is just in a case of sufficient amount of nationally allocated permits, and, on the other hand, has a strong impact on the sectoral labor division.

Environmental and Economic evaluation of Sustainable technology adoption by poor farmers in a developing country -A micro level evidence from India

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India, which was threatened by mass starvation, is now self sufficient in food. Presently Indian agriculture needs technologies that are both profitable and environmentally benign. Integrated Pest Management (IPM) is one such technology in steering Indian agriculture along a more sustainable path. The Government of India changed its agricultural policy in 1994-95 with introduction of IPM as a facilitative empowerment of farmers, resulted in continuous decline in the pesticide consumption. Hence this study is attempted.

A biodiversity index was developed based on field observations, residue analysis were carried on the products from farms and soil micro-organisms were also studied. The study revealed that the adopter farms were more diverse in insects than non-adopter farms, so was the case in evenness index, indicating more stable IPM than non-IPM farms. The soil micro-flora population also showed similar results. The analysis of rice grains, straw, husk, bran, and soil revealed that the residues of pesticides were lower in adopter than non-adopter fields.

In the study the farmers were categorized into adopters and non-adopters of IPM technology using factor analysis. The decomposition analysis of output difference showed the economic advantage of IPM. The frontier production function estimates of efficiencies revealed that the adopters were operating comparatively with lower allocative and economic efficiencies suggesting a greater potential for IPM adopters to increase outputs.

A logistic regression model revealed that the contact with agriculture extension workers, membership in organizations and attitude to reduce pesticides greatly influenced the adoption level of IPM by poor farmers.

Climatic Shocks and Food Security in Developing countries

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This paper contributes to the existing literature on climatic variability and food security. It analyzes the effect of climatic shocks on food security for 77 developing countries from 1960 to 2008. Using two complementary indicators of food security (food supply, proportion of undernourished people), we find that climatic shocks reduce food supply in developing countries. The adverse effect is higher for African Sub Saharan countries than other developing countries. Second, food supply is a channel by which climatic shocks increase the proportion of undernourished people. Third, the negative effects of climatic shocks are exacerbated in presence of civil conflicts and are high for countries that are vulnerable to food prices shocks.

Social Changes and the Gender-Environment Nexus in Contemporary Rural China: Evidence from an Inner Mongolian Village

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Agrarian development in China was basically characterized by contrasting stages of collectivization and decollectivization over the past six decades, and each resulted in sweeping social and economic changes. The lived experiences of rural women's and men's interactions with environmental resources, more specifically, their daily productive and reproductive activities in specific geographic settings, may have shaped their surrounding environment and vice versa. So far, research on the linkages between gender and the environment in rural China has received little attention, and to my knowledge, no empirical study at the village level has been carried out. Based upon an ethnographic fieldwork in an Inner Mongolian village, this article seeks to document the evolution of the gender-environment nexus and explore its determinants in larger processes over the past 60 years. A closer look at everyday experiences of local men and women indicates that the complex intersections of gender and the environment occurred in larger processes at the macro level, which were closely linked to the role of the powerful state. The dynamic relations were implicated simultaneously in shifting social norms and practices at the local level. This paper therefore suggests a holistic approach towards understanding of shifting and complex intersections, contributing to ongoing feminist debates on women/gender and the environment.xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

The effect of electoral cycles on international environmental agreements ratification

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Electoral agenda strongly influence the decisions of a leader. We argue that the probability to ratify an international environmental agreement will be affected by the holding of an election due to strategic timing adoption and vote trading. We study global environmental agreements censused in the ENTRI database from 1980 to 1999. We end up with a sample of 38 treaties de facto open to the 139 countries of our sample. Using duration models, we show that the electoral agenda has an effect on the probability of a country to ratify an IEA. Furthermore, we show that this effect is heterogeneous among countries, depending on the level of development and degree of democracy.

Toward a Framework for Implementation of Climate Change Treaty through Self-enforcing Mechanisms

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Global warming is a public bad, tackling which requires collective action by the countries of the world. Under the United Nations Convention on Climate Change (UNFCCC), countries have negotiated the Kyoto Protocol for GHG emissions control to stabilize climate change. Several issues about the Protocol remain unresolved -- first, most of the significant countries are required to take a decision on whether or not to sign such a protocol, which has large-scale implications for their energy and industrial sectors and economic well-being; second, climate change mitigation is a public good entailing that all the countries would stand to gain due to mitigation action taken by a sub-group of one or more countries; and third, there exists no supra-national authority to enforce such a protocol for the individual sovereign nations. Thus, commitment to cooperate on an international agreement on climate change control remains tenuous. The paper discusses the pros and cons of the already proposed international cooperative mechanisms toward climate change mitigation and highlights the problem of information revelation, particularly related to the abatement issues. In this context, it attempts to outline a structure of a new self-enforcing burden sharing mechanism for climate change mitigation in an incomplete information framework.

An Economic Analysis of the Andean Community Biodiversity Governance Coalition

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As a reaction to the United Nations' Convention on Biological Diversity, the mega-diverse countries of the Andean Community passed Decisión 391 on a 'Common Regime on Access to Genetic Resources'. It is unique in implementing access and benefit legislation in form of community statutory rules. The Andean Community biodiversity governance coalition bridges the gap between the existing national and international governance levels. The objective of this study is to analyse the conservation and cooperation incentives of the Andean states that determine the biodiversity coalition formation and its current design. I study the robustness of the Andean Community biodiversity coalition with regard to continued participation and defection incentives. Moreover, I analyse the access- and benefit sharing (ABS) improvements of such additional bridging cooperation in general - motivated by the shortcomings associated with the currently predominantly exclusive bilateral mechanism. As analytical framework I develop a cost-benefit-dependent incentive scheme that includes concepts from New Institutional Economics in game theoretic reasoning. The Andean Community biodiversity governance coalition seems to be primarily driven by cost-benefit incentives for biodiversity conservation - both market economic ones and non-market values originating out of environmental connectedness. Incorporating explicit benefit-sharing mechanisms can strengthen coalition stability. Regional cooperation improves the ABS procedure by overcoming the 'winner-takes-it-all'-market, facilitating the country of origin identification, increasing institutional capacity, and improving competition.

Estimation of non-tap water demand for connected and non-connected households in urban districts of Rwanda

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The study is related to water demand in five urban Rwandan cities based on households sample survey. The aim is to estimate a non-tap water demand function for households who currently lack piped connection into their house in one hand; and connected household who's relying on coping sources of water when the tap water is not available in the other hand. For unconnected households, the demand function has been estimated in two-step procedures for selection bias in the spirit of Heckman (Heckman 1979). The estimated results showed that the demand elasticities with respect to total cost (price of water and hauling cost) vary between -0.1 and -0.7. With the simultaneous equation system of water demand, we combined demand of piped and non-piped water for the sub-sample of connected households who still complementing their consumption from piped network with other water sources. The price elasticity of piped water demand for connected household who exclusively use piped water is estimated at -0.35 and at -0.37 for connected households combining piped and non.-pied water. The total cost elasticity for non-piped water demand from connected households is estimated at -0.55. Furthermore, we found possibility of substitutability between piped and non-piped demand for connected households and that for both groups; public tap remains the main coping source. Due to both huge investments that require new tap connections and low standard living of majority, we discuss on how the cost-benefit analysis must lead any water sector management and planning. xml: namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

Analysis of households demand in improved sanitation: the case of ecological latrines in Dapaong city in northern Togo

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Although sanitation is the object of many studies by international institutions (technical documents) within Millennium Development Goals, there is however very few literatures on households demand in sanitation. The article analyzes the socioeconomic factors of the desire to adopt a green technology of sanitation (the latrine «Ecosan»). Using two econometric models (probit and multinomial logit) applied to microdata from Dapaong (a town in northern Togo), we highlight a number of new results. In particular, we show that the latrine «Ecosan» is mainly popular among farm households seeking to increase the productivity of their land in a context of food insecurity. The social network also plays an important role. The privacy offered by the closed latrine influences his adoption desire. Finally, as often mentioned in the literature, a close link between access to safe water, access to improved sanitation and the prevalence of waterborne diseases is highlighted.

Water Affordability and Social Equity in Tunisian Governorates: A distributive approach

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Water as a basic human right must be guaranteed to everyone, at least in a minimum level, to cover drinking, sanitation, and hygiene needs. Using a database for the Tunisian governorates, this paper aims to fulfil two main objectives. First, the amount of water needed to cover basic households' requirements is investigated based on the Stone-Geary utility function. Second, the costs associated with the minimum consumption (minimum water charges) per governorate are then utilized to examine the affordability and equity of water bills based on i) affordability indexes and ii) concentration curves and inequality measurement indexes. Empirical evidence suggests that at national level, the minimum consumption is estimated at 100.36 m³ per household per year while it differs across governorates. Regarding the affordability analysis, water service seems to be affordable in Tunisia since minimum water charges represent a very small proportion of households' incomes. Results reveal also that minimum water charges distribution is not proportional to households' incomes distribution. The importance of these findings lies on their policy implications. On the one hand, the small weight of the water bill on the household's income allows a margin to increase water prices. On the other hand, the water authority has to consider some intergovernorate disparities in any adjustment of water tariff.

The environmental efficiency of organic farming in developing country: a case study from China

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In this case study we attempt to re-evaluate the performance of organic farming using a novel indicator, the environmental efficiency, within the framework of Stochastic Frontier Analysis (SFA). A plot-season level panel data was collected from an NGO-led organic paddy rice project in southern China. This original data is used to calculate the environmental efficiency score across organic and conventional plots. Our two-stages analysis reveals two essential points. First, in poor rural place, organic farming doesn't systematically reduce the pure nitrogen input for paddy rice production. In order to maintain the yield, organic farmers may apply the same, even greater quantity of nitrogen than conventional farmers. Second, organic farming will lose its environmental efficiency in the period of scaling up due to the overuse of nitrogen input. Hereby, we advocate that beyond the simple substitution of chemical fertilizer by organic fertilizer, a more sustainable organic farming necessitates extra effort on the control of nutrient input.

Providing organic farming products at different spatial scales: Insights from Economics

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In spite of a growing social demand for organic products and its capacity to enhance ecosystem services, organic farming remains largely under the targets. Economics tools still face scales issues due to the economic nature of organic products combined to the persistent uncertainty about its scientific measure. We develop a range of issues in organic farming provision in the light of scales changes. First, we present the definition of the status of organic farming in standard economics and the risk of market failures. Then, we detail the existing solutions and investigate their pertinence facing scales discordance. In a third section, we present the methods of evaluation of the willingness to pay of consumers. We stress the influence of scales issues on results. Finally, we present the agro-environmental policy for organic farming and imbrications between policies' efficiency and scales choices.

Assessing the Impact of El Niño Southern Oscillation on Brazilian Agriculture

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This paper aims at assessing the impacts of ENSO events on the Brazilian agricultural production. The analysis is focused in the Northeast and South regions, the most vulnerable to ENSO effects in Brazil. We adopt a three-stage approach. First, we specify a spline regression model relating sea surface temperature anomalies (SSTA) in the Pacific to weather conditions in Brazilian municipalities. Then, we specify a second group of regressions aimed at assessing how temperature and precipitation in Brazilian municipalities determine crop yields. Finally, with the estimated coefficients provided by the regressions of the early stages, we conduct simulation exercises to evaluate the impacts of ENSO on crop yields. Simulation results show that corn and bean production are quite more vulnerable to El Niño effects in the Northeast region, with productivity losses reaching 50%. The critical impact on corn and bean has important socioeconomic consequences, since these crops are mainly produced by household farmers. We also found that the impact of La Niña in the South region is quite significant for all the crops

Economics, Institutions and Adaptation to Climate Change

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Adaptation to the consequences of climate change has attracted increasing interest as a necessary complement to greenhouse gas mitigation. Economic approaches to climate adaptation are rarely articulated and discussed explicitly despite many benefits of such a framework-level discourse. Therefore, this article investigates how climate adaptation is framed and approached in economics and attempts to contribute to the development of economic frameworks of climate adaptation. First, the paper identifies and critically reviews four major strands of current adaptation economics: estimation of adaptation benefits and costs, strategies for adaptation, the role of markets and governments, and policy instruments for adaptation. While having their merits, serious methodical difficulties prevail. Moreover, the applied neoclassical framing seems too narrow to capture the plethora of governance challenges and normative criteria revealed in adaptation policy discourses and in the multidisciplinary adaptation literature. The second part of this article outlines an institutional economics approach to climate adaptation that addresses caveats in the current state-of-the-art and offers additional concepts to study climate adaptation. Moreover, promising methods and strategies for adaptation research are presented and future research directions suggested. Finally, the paper assesses the normative foundations of climate adaptation economics and their implications for positive adaptation research.

Weather insurance for members of groups with common interests

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Without access to formal insurance, smallholder farmers have to self-insure against weather shocks at a high welfare cost. Even though formal index-based insurance products have been offered that are feasible on the supply side, and eventually profitable on the demand side, uptake remains low. We consider here the frequent situation where farmers are members of groups with common interests implying that each member cares not only about his own wealth but also about the aggregate wealth of the group. We show that this creates strategic interactions among group members in deciding to insure that reduce the demand for insurance for two reasons. One is free riding due to positive externalities on other group members when a member chooses to insure. The other is potential coordination failure because it may not be profitable for a risk-averse member to insure if the other members do not. We also scrutinize the conditions on preferences and shocks under which uptake can be improved if insurance is offered at the group rather than the individual level.

Adaptation to Climate Change and Climate Variability: Do It Now or Wait and See?

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As growing attention is given to climate change adaptation as an actual policy issue, the significant meaning of climate variability in adaptation decisions is beginning to be recognized. Yet the economic implications of climate variability in the context of climate change adaptation have been little examined so far. By using a real option framework, we shed light on how climate variability could affect individuals' (farmers') investment decisions with regard to climate change adaptation. A common characteristic across all cases of the model is that as a reflection of the option value, climate variability delays adaptation. But the magnitude of delay varies greatly depending on the levels of stochasticities, their correlation, and people's risk aversion. As an illustrative case in which the delay carries policy implications, we investigate farmers' choices where adaptation involves the use of a common pool resource (water). The results show complex dynamics that would justify nuanced potential policy interventions ? for example, uncoordinated farmers with a low risk aversion may over-adapt although farmers with a high risk aversion would under-adapt under the same conditions. The analysis highlights the critical role of climate variability for the designing of climate change adaptation policy.

International Investment, Institutions, and Resource Valuation: Evidence from the Global Petroleum-Reserves Market

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A large literature on international investment demonstrates that weak institutions in host countries reduce both capital inflows and asset values. In these studies, the role of institutions in the home country has been largely neglected. The recent growth of MNEs from emerging-market countries, however, has generated interest in viewing institutions in a broader perspective. . Using data on reserve transactions in the global petroleum industry, we test whether foreign investment carries home-country institutions with it. We find supporting evidence for the theory that the home-country institutions do matter in outward investment decisions. In particular, results show that asset prices are positively related to major indexes of institutional quality, such that weaknesses in the home country reduce the amount that investors from that country are willing to pay for a petroleum reserve. As a result, firms from institutionally weak (strong) countries pay less (more) for petroleum assets than domestic investors in any given country. Our results are robust to inclusion of measures controlling for taxation, capital constraints, foreign aid, and inter-state relations.

Extracting Oil, Gas and Minerals: Institutions, Violence and Sustainability in Developing Countries

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It has often been argued that oil, gas and minerals may have a negative impact on development as measured by income per capita. This does not say much about sustainability, which is critical for developing countries whose economic growth derives primarily from the exploitation of exhaustible resources. We take adjusted net savings (ANS) per capita as an indicator of weak sustainability to examine the link between resource-dependence and sustainable development, and look at specific governance and armed violence indicators. Since it is hard to disentangle the direct effect of governance on development in empirical studies, we use the relative size of the youth bulge as instrument. Our results highlight a negative relationship between natural resource extraction and ANS but indicate that this is not inevitable. Effective checks on the power of the executive appears to be critical for sustainable outcomes. Effective legislative chambers, an independent judiciary and broad acceptance of established institutions all have a positive impact on ANS per capita. Our results further confirm that armed conflict and armed violence as measured by the homicide rate have a negative impact on ANS. We conclude that extractive industries and donor agencies should expand their focus from community-development programs to strengthening checks-and-balance mechanisms, and suggest avenues to make extractive resources a stake for peace rather than for violent rent seeking.

The resource curse in Peru

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The resource curse is a current issue, in particular for developing countries. This article analyzes the case of Peru over the period of 1960-2007. At first glance, Peru does not seem to suffer from this curse despite its abundance of mineral resources. Peru has experienced a mining boom since the 1990s, and its economy is essentially based on the export of raw mineral materials. However, Peru suffers from several symptoms of the Dutch disease: high priced minerals, an abundance of liquidity, and declining terms of trade. Our research introduces the revealed comparative advantages index in major sectors of economic activities, which confirms the Dutch disease diagnosis. We are also developing an econometric model which demonstrates that Peruvian growth is heavily dependent on mining capital. This brings us to the conclusion that a change in mining policy is vital to avoid the resource curse. It is necessary to radically rethink the management of mining rents.

Optimum Commodity Taxation with a Non-Renewable Resource

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Optimum commodity taxation theory asks how to raise a given amount of tax revenue while minimizing distortions. We reexamine Ramsey's inverse elasticity rule in presence of Hotelling-type non-renewable natural resources. Under standard assumptions borrowed from the non-renewable-resource-extraction and from the optimum-commodity-taxation literatures, a non-renewable resource should be taxed in priority whatever its demand elasticity and whatever the demand elasticity of regular commodities. It should also be taxed at a higher rate than other commodities having the same demand elasticity and, while the tax on regular commodities should be constant, the resource tax should vary over time. When the generation of reserves by exploration is determined by the net-of-tax rents derived during the extraction phase, reserves become a conventional form of capital and royalties tax its income; our results contradict Chamley's conclusion that capital should not be taxed at all in the very long run. When the economy is autarkic, in the absence of any subsidy to reserve discoveries, the optimal tax rate on extraction obeys an inverse elasticity rule almost identical to that of a commodity whose supply is perfectly elastic. As a matter of fact, there is a continuum of optimal combinations of reserve subsidies and extraction taxes, irrespective of whether taxes are applied on consumption or on production. When the government cannot commit, extraction rents are completely expropriated and subsidies are maximum. In general the optimum Ramsey tax not only causes a distortion of the extraction path, as happens when reserves are given, but also distorts the level of reserves developed for extraction. When that distortion is the sole effect of the tax, it is determined by a rule reminiscent of the inverse elasticity rule applying to elastically-supplied commodities. In an open economy, Ramsey taxes further acquire an optimum-tariff dimension, capturing foreign resource rents. For countries that import the resource, the result that domestic resource consumption is to be taxed at a higher rate than conventional commodities having the same demand elasticity emerges reinforced.

Determinants of unilateral Clean Development Mechanism project registration: an empirical analysis

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The Clean Development Mechanism (CDM) was initially designed as a bilateral instrument involving the participation of the private sector in industrialized and developing countries. Developing countries have however early on defended the unilateral approach, i.e. self-registration of CDM projects, allowing them direct access to carbon mitigation revenues. Following this observation the paper considers a sample of 71 countries over 2005-2011 to analyse the role of capital accumulation (infrastructure provision and financial development) in developing countries in determining unilateral CDM project registration. Results show that the development of the financial sector plays a key role in facilitating project implementation. Moreover, as the expected carbon revenue from projects is highly correlated with the number of registered projects, it is likely that only high income and upper middle income countries are benefitting from the unilateral approach to the detriment of Least Developed Countries (LDCs). If more flexibility in CDM rules has also contributed to its limitations, safeguards will have to be designed for the new market mechanisms discussed in Durban to ensure the participation of less CDM-represented host countries.

Border carbon adjustment and potential trade retaliation: an evaluation with MIRAGE-e

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Recently, carbon leakage risks have been seriously examined in the framework of the European Emission Trading Scheme (EU ETS). Since 2005, this system caps emissions of highly emissive European companies. But some of these companies are significantly exposed to international competition. Several Member States, in particular France, have proposed to impose a border carbon adjustment (BCA) to imports of the products covered by the EU ETS. However, as a trade measure, a BCA may be contested by a World Trade Organization member under its dispute settlement mechanism and may lead to trade retaliation from some trade partners. While the economic impacts of border carbon adjustment measures have been addressed in several papers, we are not aware of any study that assesses the implications of trade retaliation if the BCA is deemed illegal. The aim of this paper is to analyze the efficiency, in terms of carbon leakage limitation, of a BCA in complement to the EU ETS, but also to evaluate the cost of possible trade retaliation due to the implementation of the trade measure. More precisely, we consider a scenario in which large exporters towards EU -China, India and the USA- bring a WTO challenge against the BCA and apply some trade retaliation, modeled as an increase of custom duties, compatible with the WTO framework.

North-South Contractual Design through the REDD+ scheme

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Climate change is a worldwide issue that needs to be tackled. One of the primary source of carbon emissions is deforestation and forest degradation responsible of anthropogenic GHG emissions in a range of 12% (Van der Werf et al. (2009)) to 15-20% (IPCC (2007a, 2007b)). To deal with the deforestation and forest degradation issue, the international community has been promoting the Reducing Emissions from Deforestation and Forest Degradation + (REDD+) scheme to design the post-Kyoto architecture. There is currently an ongoing debate with regards to the REDD+ scheme in terms of rewards given to developing countries. The first objective of our article is to theoretically ground the REDD+ scheme as a contractual relationship in the light of the theory of incentives, either through a performance-based contract or through a conditionality-based contract. The second objective is to show that a conditional approach can be designed through actions or effective domestic efforts in developing countries towards avoided deforestation. In our analytical framework, we get a few important results. Firstly, we can state that, like in any contract dealing with hidden information, there is an information rent / efficiency trade-off within a REDD+ scheme. If the contract is performance-based, information rents are awarded to countries with the ex ante lowest deforestation in order to incite them to induce the highest efficiency whilst coping with deforestation. A puzzling result emerges: resulting avoided deforestation through effective domestic efforts can be decreasing with the baseline announced. If the contract is conditionality-based, this does play in the opposite way as information rents are awarded to countries with the ex ante highest deforestation, and therefore the optimal scheme implies to tackle forest areas where deforestation is per se the highest. Secondly, whilst comparing these contracts, there is a baseline threshold in terms of efficiency towards less deforestation.

Economic Valuation of Water in Agriculture ? A Case Study of Madurantakam Tank in Tamilnadu

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Water is one of the most valuable inputs of agricultural production. Water management for agriculture is affected by long established practices other than economic efficiency. In spite of rapidly increasing value for water resources, water demand functions are totally ignored in the major policy formulations. Because of its key role in managing water demand and augmenting water supply, water pricing is an important policy instrument for creating incentives to conserve and allocate water efficiently. In Tamilnadu, one of the southern states of India, the lowest yield per unit area in irrigated land is only from the lands irrigated by the non-system minor irrigation tanks due to unattended upkeep and maintenance. Existing irrigation structure requires reforms to make it functionally more effective. The government is undertaking rehabilitation work; but the amount allotted is insufficient for the proper maintenance of the tank over a period of time. The paper attempts to elicit the willingness of the users of water of Madurantakam Tank, to pay in an effort to arrive at the minimum charge for the use of the scarce resource so as to ensure efficiency and conservation through pricing.

Water scarcity and conflict - a reciprocal problem?

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The paper derives the effects of repetitive conflicts on the depletion path of a water stock. While on a broader scope, water can be considered a renewable resource, in a local setting in an arid area exhaustibility seems to be a major problem. We therefore model water as a non-traded exhaustible resource. The analysis is based on a Cournot model with two players maximizing expected lifetime utility by choosing water extraction and contest effort over three periods. In each of the periods the winner and loser are both awarded a share of the remaining water stock (with the winner's share being at least one half). To account for the special characteristics of water consumption a CRRA utility function augmented by a subsistence consumption level is used to model consumption preferences. Our first result is that the interaction with a second player may alter the standard results regarding resource extraction under uncertainty by Long (1975) (at least quantitatively). Since war effort is correlated to the size of the remaining resource stock, we get the following second result: A policy maker, who is able to modify the sizes of the awarded shares in the conflict, might face a trade-off between peacekeeping (low war efforts) and conservation (flat extraction path).

Arab Sovereign Wealth Funds and Investments in Land and Water in Sub Saharan African Countries

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The acquisition of land and water resources by domestic and foreign investors in Sub Saharan African countries is a recent and important phenomenon. During the international economic and financial crisis and following the increase in food and cash crops in 2007-2008, investments in land in countries rich in land and water resources increased substantially. At the same time, rising international oil prices create the conditions for many Arab oil rich countries to establish or invest more resources in their Sovereign Wealth Funds. These countries show peculiar characteristics in their agriculture sector because of water and arable land scarcity. Against this background, this paper analyzes first the motivations for investments' flows in land and water. Many Gulf Cooperation Council and other Middle Eastern and North African countries lack enough arable land and water resources and investing in these sectors represents an opportunity to solve their scarcity problem. The paper also examines the availability of water in SSA countries. Given the scarcity and lack of reliable data, after a descriptive part, we analyze the links between Sovereign Wealth Funds in Arab Countries and the acquisitions of land and water resources in Sub Saharan African countries through the implementation of a probability model. This latter shows preliminary interesting results on the relationship between investment choices and water resources availability and institutional framework.

Fishery Resources and Trade Openness: Evidence from Turkey

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In this study, we investigate whether the trade in fish and fish products contributed to the decline in a given number of fish species in Turkey. The overall purpose is to test the theoretical findings of Brander and Taylor (1997) who argue that trade openness decreases fish harvest in a small open economy characterized by a regime of open-access to fishery resources. To this end, we estimate a panel data model to measure the effects of trade openness on fish harvests in the case of 57 fish species observed from 1996 to 2009 in Turkey. Estimation results reveal a backward-bending supply curve for the fish harvest. Furthermore, we find that the indicator of openness to trade has a significant and positive impact on the fish harvest. Our results suggest that further openness to trade would put additional pressure on Turkey's already declining fishery resources.

The Response of Fishermen to Fishing Control Policies in Southern Songkhla Lake, Thailand: A Field Experiment

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In this study, game theory was used to analyze the extraction behavior of fishermen around the Southern Songkhla Lake where southern Thailand. The field experiments were designed based on the concept of non-cooperative game theory for investigating fishermen's behavior in response to four management policy options: external regulations with individual transferable quotas (ITQs) and with individual quotas (IQ), and co-management with ITQs and with IQ.

The analysis examined responses under high and low fish stocks that arise due to seasonal salinity in the Lake. Higher fish stocks encouraged fishermen to increase their extraction. With management options, a co-management policy led to better results than imposed external regulation in terms of both a reduction in extraction and the sustainability of the resource. Therefore, the co-management was the recommendatory policy for management methodology. With ITQs and IQ, there were no significant differences between them in terms of reduction of extraction and sustainability of resource use; however, there were significantly less violation behaviors when ITQs were used than with IQ, as the ITQs provided more flexibility for fishermen who desired to increase their extraction while still following conservation guidelines. Therefore, ITQs are recommended as the best policy, although they need to be implemented with appropriate penalties.

Open Access vs Exclusive Access With Two Variable Factors

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We analyse the general equilibrium effects of a movement from open access to exclusive access in the resource sector in the presence of two variable factors, labor and capital. We provide necessary and sufficient conditions under which the return to labor increases following a change of property regime from open to exclusive access, while that of capital decreases. More precisely, we show that the passage from open access to exclusive access will benefit (harm) the factor that is initially used more (less) intensively in the manufacturing sector relative to the resource sector. A link is made with the output elasticity with respect to inputs.

Payments for Environmental Services can enhance Community Forest Enterprises development

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The PSA-H is a Mexican federal program of payment for environmental services hydrological. This article investigates how the PSA-H can impact the development of Community-Forest Enterprises. This type of community-based organisations developed strongly in Mexico and is now a prominent actor of the timber value chain. Moreover, they are considered as way to conserve the forest cover since they can not sell timber on the legal market without complying with a Management Plan insuring that they are logging at a sustainable rate. We hypothesize that PSA-H can contribute to CFE development by relaxing a credit constraint. Once checked for potential endogeneity of PSA-H reception, our econometric results confirms this hypothesis.

Rural Poverty, Livelihood Strategies and contribution of Biomass to Household Economy: Panel Data Evidences from Ethiopia

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Biomass resources extracted from agricultural residue or natural forest environment constitutes integral component of livelihood for poor society in Ethiopia, typically the rural dwellers. To diagnose the level of biomass resource use and degree of dependence by heterogeneous society we used a dynamic panel data evidences from three major regions. The paper emphasized major drivers of biomass resource dependence in the context of rural Ethiopia within the general livelihood household activity choices. The major factors that determine livelihood activity choice and dependence on biomass activity were categorized as: household's endowment of asset resources, household's demographic characteristics and economic and exogenous factors such as markets prices and technologies. To examine the household livelihood strategy choice in general and biomass resource dependence we constructed clustered dependent variable based on the share of biomass income in total household income, and then applied the multinomial logit model (MLM) regression. Major drivers of household activity choice in general and biomass resource reliance in particular were investigated. Knowledge based economy is, thus, key to help reduce rural poverty and improve the eco-environmental problem. For instance, investment on innovative bio-economy as well as more lucrative employment opportunities would help household to optimize livelihood activity choice and enhance sustainable management of biomass resources. Therefore, since biomass resources contribute a vital part of rural livelihood and are the intersection point of rural poverty-environmental nexus, well-focused policies that broaden activity choice: like credit, off-farm employment opportunities etc. deem crucial. xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

From Global to Regional Model: an Empirical Assessment on Tropical Deforestation Drivers

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Deforestation and forest degradation have been gaining high visibility on the international political agenda, in particular forest cover is tied to climate change issue. Copenhagen Accord and Cancun Adaptation Framework assign a pivotal role in achieving the objective of stabilization of GHG emissions to forests management. The medium and long-term goal of the international community, is the containment of deforestation, particularly in developing countries, by identifying the drivers that can affect the sustainability of land use choices. In order to select corrective policies, accurate data are needed. The first step of our analysis, thus, is a detailed review of available FAO time series on forest area data, on which we test if the significant variables for forest cover change, differ between global or regional level. To this end we draw a panel of 81 tropical countries and three regional samples (Sub Saharan Africa, Latin America & Caribbean, South East Asia and Pacific) of four periods between 1990 and 2010. Evidence support our hypothesis and should induce to set different international policies for different homogenous area in order to efficiently reduce forest clearing.xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

Improving Solid Waste Management in the Island of Beauty (Corsica): a Rank-Ordered Logit Approach with Observed Heterogenous Ranking Capabilities

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In the Mediterranean so-called 'Island of Beauty' (Corsica), solid waste are mainly disposed in landfills. Most of these landfills do not comply with European Union Directives. Recently, an incinerator project was abandoned due to strong opposition from various associations and civil society representatives. Opponents to the project put forward potential threats in terms of pollution. Our study applied a rank-ordered logit model to estimate marginal willingness-to-pay to decrease pollution associated with solid waste management, using data from a ranking choice experiment. It has long been recognized that the rank-ordered logit model provides efficiency gains, when compared to the basic multinomial logit model. However, respondents may not all be able to give a reliable complete ranking of the alternatives they face. 'Noisy' rankings result in estimate biases, so that it has even been suggested to only use the first three ranks for estimation. In order to deal with that ranking capabilities issue, we designed the survey that we conducted in Corsica in a way that permits to reveal the actual ranking capabilities of the respondents. This allows us to estimate models using the full-ranking of the alternatives and models using a reliable sub-ranking of the alternatives. Using rankings given by a representative sample of the Corsican population (530 respondents) we provide estimates of the willingness-to-pay for various respondent profiles, paying particular attention to the rural/urban divide and to the legitimacy of the waste fee as a policy tool. We find strong evidence that estimations on the full-ranking data set and on the reliable sub-ranking data set differ widely.

Private Pay or Public Pay? A Choice Experiment Study on Air Pollution Related Health Valuation

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Based on personal disposable income, the traditional Hicks willingness to pay valuation method for public goods benefit is disputed in theory and in reality: whether the public goods should be paid by the private sector? Whether the WTPs expressed by low-income group reflect the "real benefits" under the affordability restrictions? The article introduces an alternative payment vehicle, called tax reallocation, from the "public pay" angle, can compares WTP results from the "public pay" and "private pay" survey. Economics framework has been developed and a case study of health benefits valuation by applying choice experiment from improvement of air quality in Beijing by comparing the two different payment vehicles, and explained the income effects on WTPs and policy implications of public pay approaches. The results show that the marginal rate of substitution (MRS) from "public pay" is 50% -200% higher than from "private pay" approach, and this difference indicates that the benefits of public projects evaluated by traditional WTP research method might be biased. The income effects are different for each payment vehicle, due to the constraint of ability to pay, the benefits brought by public projects to low income people might be underestimated by traditional WTP method. The WTP from the tax reallocation method has been released of a certain degree from disposable income constraints, may better reflects the social equity.

Road Project Opportunity Costs Subject to a Constraint on Greenhouse Gas Emissions

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The decision of implementing a road transport project is usually performed by means of cost-benefit analysis. The interest of using CBA is to evaluate all the impacts of a project during its lifetime by monetizing its external effects. It is based on weak sustainability, implying a possible substitution between physical and man-made capitals. However, the nation or the region can implement a strong sustainability policy. This paper aims at finding an evaluation method for regions or nations so that they can implement their project, which generates GHG emissions in a context of strong sustainability. This method is based on the opportunity cost of projects corresponding to the minimum reduction cost of GDP necessary to offset emissions from road transport project. From this information, we can assess maximum budget devoted to GHG emissions offsetting from road projects. We make an illustration for the Aquitaine region of France. This method can also be extended to transition or developing countries.

Contingent valuation for a better air quality: the case of car pollution in Quebec and France

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The problem of air pollution and greenhouse gas emissions is constantly repeated. Governments and civil society organizations act more in concert to implement controls to limit the environmental consequences of human actions. The private sector is also changing, but slowly, seemingly because it still lacks strong incentives to initiate a great technological change toward more "green products". One argument used is the cost of these technologies and the willingness to pay of individuals to benefit from it. The purpose of this paper is to establish, through a contingent valuation study, the value that Quebec and French people attribute to a reduction in air pollution from vehicles. For this, we proposed a price increase for vehicles of similar ranges, but less polluting. Various econometric estimation methods were applied and corrections to the responses were made according to the degree of certainty indicated in their willingness to pay response (VAP) and on how to consider "Do not know" answers. Results indicate a VAP of several thousand Canadian dollars in 2009, estimated between 3000 and \$ 7000. The VAP is also higher in France than in Quebec.

Sustainability in the Amazon: do booms in deforestation lead to busts in development?

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We revisit the hypothesis tested in Rodrigues et al. (2009) that the process of human development in Amazonia follows a boom and bust (inverted U) pattern. We show that the 'boombust' pattern that Rodrigues et al. report is a spurious artefact of spatial correlation, driven primarily by the large, multifaceted (and unobserved) differences between municipalities in and around Amazonas and Maranhão states. We confirm these (non?) results in the time series data; there is no 'smoking gun' dynamic boom and bust associated with land clearing in any municipality data from 1980 to 2000. Furthermore, the past economic performance of municipalities categorised as 'postfrontier' by Rodrigues et al. themselves are shown to have been economic underperformers since the 1970s, and if anything they have improved their relative economic standing in the years since 2000. In sum, we find no evidence in either the cross section or the time series data of any 'boombust' patterns of development in the Brazilian Amazon.

Public expenses, credit and natural capital: Substitution or complementarity?

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Improving access to capital through credit and public spendings is an important step toward development and poverty alleviation. At the same time, deforestation-related activities, like agricultural expansion, can be seen as relying on natural capital, through the depletion of forest resources. This paper assess the relationship between financial development, public spendings and deforestation. Are they substitute or complement? Our econometric analysis shows that deforestation is positively correlated to access to credit and public spendings, which gives some evidence that natural capital is a complement to credit and public spendings.

Dynamics of Indirect Land-Use Change: Empirical Evidence from Brazil

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The expansion of a given land use may affect deforestation directly if forests are cleared to free land for this use, or indirectly, via the displacement of other land-use activities from non-forest areas towards the forest frontier. Unlike direct land conversion, indirect land-use changes affecting deforestation are not immediately observable. They require the linking of changes occurring in different regions. This paper empirically estimates these indirect effects for the case of Brazil. It presents evidence of a positive relationship between sugarcane expansion in the south of the country and cattle ranching in the Amazon, suggesting that the former is indeed displacing the latter towards the forest frontier. This displacement effect is shown to be a dynamic process materializing over 10 to 15 years.

Development and land use in developing countries: an empirical analysis of the cumulative nature of both deforestation and agricultural expansion

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Deforestation remains one of the major environmental issues in developing countries and agricultural expansion is its first cause. In this paper, we study the cumulative nature of deforestation. First, we identify the factors that determine the occurrence of a turning point, that is when deforestation ceases in a given country. Second, we study the determinants of land uses at the turning point : level of both forest and agricultural land. Those results highlight the cumulative nature of deforestation and may help public policies to make occur earlier in length and higher in forest cover a turning point in developing countries which have not yet observed one.

EU Biofuel Policies and The Regulation of Indirect Land Use Change

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The contribution of biofuels to reducing greenhouse gas emissions (emissions) has recently been questioned by leading scientists because production of biofuel feedstocks causes indirect land use change (ILUC) that in turn causes emissions. We discuss the policy proposals put forward by the European Commission (EC) to control for ILUC. Firstly, we provide a definition of ILUC, briefly present ILUC modelling approaches and display their methodological and data-related shortcomings. As models are neither able to calculate a biofuel feedstock- nor a location specific ILUC emission factor, modelling results cannot be used to implement a biofuel feedstock- or location specific ILUC regulation. On that basis we find an increase of the minimum emission saving threshold as the only effective policy proposals of the EC . What threshold would rule out all biofuel options with a negative emission balance, depends essentially on the risk that one is willing to accept for violating the positive emission balance of certain biofuel options. Going beyond the policy proposals of the EC we conclude that in the end ILUC can only be controlled by requiring that all agricultural production becomes subject to sustainability assessments, by implementing sustainable land use planning and by controlling for illegal deforestation.

Emerging Innovation system and Environmental Innovation: the case of CCS and BCCS.

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While the environmental innovations will play a key role in the transition towards new energetic systems, their implementation is rather difficult to realize. They incur environmental and knowledge externalities, and they are highly uncertain. Their development needs a public support, mainly from the advanced countries. The developing countries as latecomers can benefit from these innovations without incurring their development costs, but are reluctant to move towards a more decarbonized economic model without a financial support. From this point of view, mitigation techniques, especially Carbon Capture and Storage techniques, from fossil fuels (CCS) or bioenergy (BCCS) appear to be a promising way to reach stringent greenhouse gas reduction targets. They would allow to maintain the use of fossil fuels during a transition towards a more decarbonized economy. These techniques are nevertheless submitted to the evolution of mitigation costs, to the regulatory uncertainty and to their social acceptability. They should be implemented in a first time in advanced countries, then in developing countries that have no commitment in their GHG reductions. CCS deployment could either be financed in a first step by CDM, but will require other financing support which will be an important stake in the next international climate policy negotiations.

Energy as a driver of growth in oil exporting countries?

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This paper is a contribution to the on-going debate over whether there is a relationship between energy consumption and economic growth. Although the oil exporting countries are among the most energy-intensive economies in the world, little attention has been paid to the features of their energy consumption. Therefore, this study empirically investigates the two variables dynamic relationship in 12 oil exporting countries from 1990 to 2010. Using recently developed panel econometric techniques, the present paper accounts for cross-section dependence when analysing the energy-income nexus. The results of this study indicate that there exists a long-run equilibrium relationship between energy consumption and economic growth. Furthermore, the empirical evidence of a dynamic panel error-correction model reveals a short-run unidirectional causality from energy consumption to economic growth, whereas in the long-run, it is the economic process that determines the energy consumption trend.

Food for Fuel: Does U.S. Energy Policy Increase Poverty in India?

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Many countries have adopted energy policies that promote biofuels as a substitute for gasoline in transportation. For instance, 40% of U.S. grain is now used in transportation and this share is expected to rise significantly under the current Renewable Fuels Mandate. This paper focuses on the welfare and distributional effects of the U.S. mandate on India. First, we use a model with endogenous land use to estimate the effect of the biofuel mandate on the world price of food commodities, in particular rice, wheat, sugar and meat and dairy, which provide almost 70% of Indian food calories. We obtain world price increases of the order of 10% for most of these commodities. Using Indian micro-level survey data for consumption and income, we estimate the effect of these price increases on household welfare. We account for negative consumption impacts as well as the positive effects through wages and income. We consider both perfect and imperfect pass-through from world to domestic prices. We show that the net imp welfare is negative as well as regressive, i.e., US biofuels policy affects the poorest people the most. About 42 million new poor may be created in India alone. Under imperfect pass-through, this number declines to 15 million. The main implication is that U.S. energy policy that mandates the production of fuel from food, may exacerbate the number of people living in poverty in the developing world.

The environmental Kuznets curve for deforestation: a threatened theory? A meta-analysis

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Although widely studied, deforestation remains a topical and typical issue. The relationship between economic development and deforestation is still at stake. This paper presents a meta-analysis of Environmental Kuznets Curve (EKC) studies for deforestation. Using 71 studies, offering 631 estimations, we shed light on why EKC results differ. We investigate the incidence of choices made by authors (econometric strategy, deforestation measure, temporal coverage, geographical area, measure of economic development...) on the probability of finding an EKC. After a phase of work corroborating the EKC, we find a turning point after the year 2001. Building on our results, we conclude that the EKC story will not fade until theoretical alternatives will be provided.

Impact of urbanization on national residential energy use and its implications for climate change: Evidence from a panel data analysis

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The influence of urbanization on national energy use and its implications for climate change have been increasingly studied in recent years. However, very few existing studies have considered a potential nonlinear relationship between urbanization and energy use. This paper explores rigorously the nonlinear relationship between urbanization and national residential energy. A sample of 132 countries during 1971-2009 is analyzed using both per capita (EKC) and aggregate energy use (STIRPAT) models. Interestingly, after controlling for population size and income per capita, the results from the STIRPAT model show that residential energy use and electricity use first decline and then rise with urbanization levels. The turning point of the former occurs at 39%, while that of the latter occurs at 10%. Conversely, biomass energy use initially increases and then decreases as urbanization rises above 18%. Moreover, transition fuels (charcoal, coal and kerosene), and modern fuels (liquefied petroleum product gas and natural gas) increase monotonically with urbanization. Similar results have been confirmed by the EKC model though the exact occurrence of turning points is slightly different. Overall, this study suggests that urbanization reduces residential energy use in countries with urbanization levels lower than 39%, while it increases residential energy consumption in countries with urbanization levels greater than 39%. It also implies that urbanization contributes to fuel switching from carbon neutral fuels toward carbon intensive fuels. These findings not only shed further light on the existing literature, but also have important implications for global energy and climate change policies.

Environmental Kuznets Curve and Ecological Footprint: A Time Series Analysis

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In this paper we examine the Environmental Kuznets Curve (EKC) hypothesis using the Ecological Footprint (EF), a more comprehensive indicator of environmental degradation, in time-series dimension for 15 countries covering the 1961-2007 period. We first test the EKC hypothesis from traditional linear, quadratic and cubic functions, in standard and logarithmic specifications. The EKC hypothesis is only supported for Chile and Uruguay with the quadratic functional form. We also find that most of the countries exhibit a positive linear relationship between the EF and GDP. Finally, we study the long-run relationship between the EF and GDP. The results show evidence of long-run relationship between income and EF for some countries exhibit (Brazil, Chile, China, and Uruguay). More particularly, Spain displays a cubic relationship, taking a N-shaped function form.

Sustainable Development Measurement: Change in Wealth and Change in Consumption

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This study offers a critical assessment of "genuine saving" through a discussion of the theoretical literature and an empirical analysis. It highlights the many conceptual and empirical issues concerning this index. In this discussion we distinguish between regional characteristics as well as analyze the data with respect to changes in consumption per head using econometric analysis between 1974 and 2007 for 93 countries. The econometric results support the view that genuine saving has a strong economic and statistical significance as a determinant of changes in consumption. Various econometric methods are utilized and sensitivity analyses are conducted

Ecological inequalities, poverty and forest income: a case study from Burkina Faso

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In African countries, the use of wood as energy by households is a common practice which often can lead to an obvious deterioration of forests. In Burkina Faso, wood energy has contributed to the national energy balance of a mean value of 74,94% in 2008; this contribution is higher for households energy consumption that reached the proportion de 94,79% for the same year (Department of Energy, 2010). The aim of this paper is to put an emphasis on the relationship between the production of wood-energy by the local populations and the preservation of forests on the long run. In order to connect natural elements (ecosystems services, access to natural resources...) with social elements (statutes, standards of living, preferences, poverty...), we use the concept of ecological inequalities. Using such a concept allows us to analyse the way production of wood-energy can affect the natural dynamics of the forests under concern. Taking into account data combining in particular the location of households (rural or urban), standards of living of different groups of persons (lumberjacks, carters...), the rules in the management of the forest, the organization of the villages with ecological variables (threshold of renewability, biological diversity of the species exploited, level of harvest...) may provide a first step for modeling some relevant interactions between human activities and ecological systems in this respect. On this basis, we propose to characterize the ecological inequalities associated with the management of forest in Burkina Faso. For this purpose, we focus on some processes by which those inequalities emerge: should they be sustained by an unequal distribution of the services provided by forests within the population, or by the deterioration of the forests because of specific cultural practices. Our work is based on data related to 300 lumberjacks located in different areas where the forests are managed in Burkina Faso. In our study, we use in particular the different forest and agro-climatic potentialities between these managed forests to explain the peasant's and/or lumberjack's income difference in these areas. In this way, ecological inequalities and its main causes in the case of forestry in Burkina Faso are presented and discussed.

Commons as insurance: theoretical predictions and an experimental test

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In this paper, we deal with the impact of the safety-net use of Common Pool Resource (CPR) on the individual investment into and extraction from the commons. We propose a theoretical model with two steps: agents of the community choose to invest in their private project and in the commons; second, they choose how much to extract from their private project and the commons. The model compares two types of risk-management tool: CPR as risk coping and risk diversification mechanisms. It also compares two types of risk: risk on a private project and risk on CPR investment by other community members. In a second part of the paper, we test empirically the theoretical results through experimental economics. Such a test needs to propose a new CPR game composed of two periods, an investment one and an extraction one. We propose such an original game inspired from the two existing CPR games, Investment game (Ostrom et al [18]) and Request game (Budescu et al. [6]).

Land Inequality and Deforestation in the Brazilian Amazon

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The aim of this paper is to demonstrate the relationship between land inequality and deforestation in the Brazilian Amazon. Therefore, it is developed an occupational choice model where an individual chooses whether to become a farmer or to clear land at the agricultural frontier. This model provides theoretical predictions that are tested empirically. Based on data from 515 municipalities, this paper estimates a Tobit model in order to test the theoretical predictions. Basically, it has been shown that there is little statistical evidence to support the existence of a direct relationship between land inequality and deforestation. Nevertheless, when one takes into account the effects of land inequality on deforestation through its interaction with credit and land reform policies, it can be shown that the pattern of land distribution, indeed, plays a role for deforestation. There is a positive relationship between credit and deforestation in more unequal places. Furthermore, this paper provides evidence that land reform in more unequal municipalities reduces deforestation. Hence, it is clear that there is a role for government to increase social welfare and reduce deforestation rates.

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Land use change (LUC) and Socioeconomic Development in Brazil

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The knowledge about the correlation of LUC and economic development is crucial for a spatially disaggregated land use planning policy that accounts both for nature conservation and the role of agricultural expansion for the development of emerging economies. The globally available land area is limited and becoming increasingly scarce due to demand for nature conservation and an increasing demand for food, fodder and bioenergy. Furthermore, the expansion of agricultural production areas is often considered essential for economic development. This applies to Brazil which has become one of the fastest growing economies in the world, experiencing at the same time tremendous LUC of Cerrado and Amazon forest. Therefore, Brazil is globally one of the biggest emitters of LUC emissions. Yet the interrelationship between the economic development and the occurring LUC has not been analyzed so far. It is unclear if the interrelation of LUC and socioeconomic factors is fairly stable over the regions or if there are crucial factors of the local agricultural, economic and geographic structure that determine LUC dynamics. We analyze these questions by using spatially disaggregated economic indicators and agricultural census data for entire Brazil from 1995-2006 in combination with satellite based LUC data applying spatial econometric methods.

Energy Efficiency and Split Incentives in the Residential Sector: The Tenant Landlord Problem

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Reducing GHG emissions is nowadays becoming one of the priorities of policy makers in many developed countries. However, actual investment in energy efficient systems is still relatively rare. An important barrier to energy consumption in housing sector are split incentives also called principal-agent problem. Indeed, the landlord wants to minimize the energy systems costs and has no return on investment while the tenant wants to minimize his energy bill. This paper aims at carefully explaining the home renovation decision of households in a theoretical model in which there exist split incentives. In particular, we explicitly take into account that such a decision takes place in an uncertain environment, in which there exist arbitrages between consumption and investment in home renovation. Solving the program, we obtain two reaction functions. Using these last, a Cournot Nash equilibrium is computed. We obtain that tenants are not willing to invest. The optimal policy is the subsidy of investment but it is necessary to combine it with the repercussion of homeowner's investment cost on the rent to obtain a higher effect. Public policies have a stronger impact on landlord's investment than on the tenant's one. At the equilibrium point, even with public policy, the tenant does not want to invest. The problem of principal agent seems to be partially confirmed. The level of investment is not sensitive to the uncertainty related to investment cost. But uncertainty on investment efficiency has a positive effect on investment. The results show that expecting high energy cost and high return on material efficiency investments are close to profitability even without policy support. Note however that in such a context, public policies lead to a rebound in demand.

Environmental policies and innovation: the role of an Agent-Based Model in the propagation of renewable energies

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The production of energy from renewable sources finds its main stimulant in the presence of policies aiming at making them economically preferable to the non-renewable ones. Furthermore, the introduction of public incentives turns to be essential for the propagation of renewable energy plants (innovations) within a Country whose economy is based on traditional energy production and consumption.

The present work focuses on the analysis of the environmental policies that are capable to affect both the introduction and the following propagation of solar plants in the context of Transition Economies, structurally characterised by the lack of suitable energy policies (e.g. incentives, feed-in tariffs) and by the need to revise investment and access to credit conditions to further speed the propagation of the technological innovation.

To this aim, an Agent-Based Model has been developed as a possible political decision support tool in order to simulate and characterise the propagation dynamics of energy innovations in Economies whose organization has been speculated to be composed of general firms. Such a simulation will help to detect public intervention peculiarities capable to encourage the propagation of the renewable energy production among firms, further qualifying their strategies related to the possible implementation of the innovation itself.

Household Fuel Use in Rural China

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Rural households in developing countries, especially in China, have and will continue to heavily depend on traditional dirty fuels for cooking. The increasing concern has been given to the negative externalities of the extensive uses of these fuels on the environment and human health. However, factors determining fuel choice and driving fuel switching in rural households in developing countries have not been giving adequate attention by both theoretical and empirical researches. To address these issues, we develop a non-separable household model on fuel use and estimate random effects panel logit and multinomial logit models using micro-household survey data from the China Health and Nutrition Survey (CHNS). We find that the empirical results support the theoretical model, indicating that fuel use in rural households depends on fuel prices, food prices, household income and a set of household and community characteristics, such as, household having electricity subsidy, household head living with parents, and community near open trade area/open city/special economic zone. The policy discussions particularly suggest that the rural energy policy is not independent, instead, it should be integrated into agricultural policies and one should take into account both demand-driven and supply-driven factors rather than considering one without another to design the appropriate policies.

Electricity (in) efficiency in transition economies: evidence from a firm's survey

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The paper describes the main determinants of electricity efficiency / inefficiency in 27 transition economies. We use the BEEPS enterprise survey done in 2008-2009 over 12000 enterprises. We explain energy intensity as the share of electricity costs over total sales at the firm level. We want to provide a detail analysis of the enterprise electricity cost patterns. In particular, we shine light on the role played by firm characteristics and some key economic drivers, as bad governance and local financial development. We provide an original analysis and findings of the effect of the poor access to electricity supply on firm's electricity costs

A dynamic model for weak sustainability

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The aim of this article is to investigate the impact of international trade on capital stocks accumulation. To this end, I develop a dynamic Heckscher-Ohlin model of international trade with 5 goods, 4 factors and 2 countries. One country is relatively well-endowed in natural capital, the other in produced and human capital. I show that when the factor price equalisation hypothesis is verified, both countries, regardless of their beginning of the period comparative advantages, move away from natural capital intensive goods and invest in produced capital. This behaviour can be explained by the spectacular rise of the other factors prices as countries approach steady-state. The beginning of the period capital intensive country ends up increasing consumption while the exhaustible resources intensive country has to reduce it. This article suggests in line with previous studies, that the starting point matters when the decision to open up to trade is taken.

Democracy, inequality and the environment when citizens can mitigate privately or act collectively

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We study the political economy of the environment in autocratic, weak and strong democracies when individuals can mitigate the health consequences of domestic pollution privately at a cost as well as join with others to control pollution collectively through public policies of different kinds. The economic setting is that of a small open economy in which earned incomes depend importantly on trade in dirty goods. When private mitigation is feasible, income inequality leads to an unequal distribution of the burdens of pollution (in accordance with the evidence), polarizing the interests of citizens in strong democracies and of ordinary citizens and elites in less democratic regimes concerning both direct control of pollution and as well as indirect control via the regulation of trade openness. In this context, we conduct a comparative analysis to investigate how the eco-friendliness of regimes - their degree of environmental control by direct or indirect means - varies with the cost of private mitigation and with the nature of income inequality. In the process we explain why the relationship between income and the demand for environmental control may be non-monotonic in the presence of private mitigation, and also show how the ranking of regimes may be complicated by the multi-dimensionality of the issue space of public policies.

The carbon embodied in the bilateral trade between China and Canada and China-France: What would have been the efficiency of Kyoto Protocol?

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Based on single country linked-Input-Output model, this paper calculates the balance of emission embodied in trade (BEET) and pollution trade terms (PTT) for the bilateral trade between China and Canada and between China and France for the period between 1990-2003, for both national and sector level. Our results report positive BEET values and PTTs larger than 1 and confirm China as a net emission exporter in both bilateral trade. However, our results also reveal that China's exports are concentrated in relatively less-polluting sectors. We further decomposed the emission embodied in trade into the emission transferred by trade and that created by trade. This decomposition actually reveals that a country as China which exports principally in less-polluting sectors to have a positive BEET is because that the carbon «created» by trade between China and Canada is dominantly big and the relatively less carbon-intensive exporting sectors in China, such as textile, etc. have actually higher carbon intensity than their counter-partners in Canada. The results of IO analysis are also used in a gravity-model-style econometric model to identify the potential determinants for the evolution of BEET between China and Canada and that of China and France, in which the determinant role of the differences between characteristics of two countries such as technology, employment, factor endowment, bilateral trade policies, and environmental policies are studied. Our country-level comparative study seems also to provide some supportive evidence for the existence of so-called carbon leakage phenomenon only for the trade between China and France, a good student according to Kyoto Protocol, but not for that of China with Canada, who is a carbon club member along with US and Japan, which experienced significant carbon emission increase during the period 1996-2004.

Sustainable development and industrial Ecology: The success story of Industrial Symbiosis

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Since 1989, industrial ecology has created a new perspective on industrial development (Zhu, Lowe, Wei, Barnes, 2007). Industrial complexes should be designed to resemble natural ecosystems in order to use energy, water, and material resources optimally while at the same time minimizing wastes.

As a part of industrial ecology, the study and promotion of industrial symbiosis have gained increasing attention. Building on the notion of biological symbiotic relationships in nature, industrial symbiosis consists of place-based exchanges among different entities. Chertow (2004, p. 2) gave a definition: « Industrial symbiosis engages traditionally separate industries in a collective approach to competitive advantage involving physical exchanges of materials, energy, water, and/or by products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity ». By working together, business strive for a collective benefit that is greater than the sum of individual benefits that could be achieved from acting alone. This kind of collaboration can improve social relationships among the participants, which can also extend to surrounding neighborhoods. Progress toward developing programs of industrial symbiosis is significantly influenced by a number of factors, including the nature of a company's operations, the industry history of the region, the extent of peer pressure, the positioning if a coordinating body in the region, and the company's approach to awareness-raising and recruitment.

The term « industrial symbiosis » was actually coined to describe a group of interconnected industries in the Danish town of Kalundborg (Ehrenfeld, Gertler, 1997) that saw a network of by product exchanges and other forms of collaboration evolve spontaneously over three decades (Chertow, Ehrenfeld, 2001).

Our paper will seek to learn from the experiences of industrial symbiosis. It is divided into two parts. In the first part, we present the different processes which can play a role in the conceptualization of industrial symbiosis (Boons, 2011). Two levels are involved in industrial symbiosis, the regional level of industrial system and societal level (institutional and organizational mechanisms : routines, distribution of the symbiotic relationship). In the second part, we will report four illustrations of industrial symbiosis, one in Australia (Schwartz, Steininger, 1997), one in Korea (Behera, 2012), one in China (Zhu, Lowe, Wei, Barnes, 2007) and the last in Sweden (Karlsson, 2008). Built on the model of Kalundborg, these symbioses have developed a complex system of interactions in many activities (mining, sugar refining, biofuels, forestry ...). We will highlight the key factors of success and failure of industrial symbiosis.

Authors Index

Adewara Sunday	20
Adirubane Durairaj.....	25
Afifi Tamer	8
Andersson Henrik.....	21
Andrade De Sá Saraly.....	62
Araújo Paulo.....	36
Badolo Felix.....	26
Bagayev Igor.....	79
Basu Sujata.....	11
Bayramoglu Basak.....	50
Beumais Olivier.....	56
Beine Michel.....	1
Bernard Sophie.....	81
Bertini Raffaele.....	49
Bezabih Mintewab.....	16
Bontempi Stefano.....	77
Brunette Marielle.....	73
Cantuarias Carmen.....	42
Carbonnier Gilles.....	41
Castelani Sergio.....	12
Cazals Antoine.....	28
Chantarasap Pathomwat.....	51
Charlier Dorothée.....	76
Chiroleu-assouline Mireille.....	46
Chloé Tankam.....	35
Choumert Johanna.....	19, 35, 68
Click Reid.....	40
Combes Jean-louis.....	61
Combes Pascale.....	68
Congar Ronan.....	52
Couharde Cécile.....	2
Dakpo Hervé.....	68
Dallmann Ingrid.....	4
Darne Olivier.....	70
Daubanes Julien.....	43
Delacote Philippe.....	61, 63, 73
Delzeit Ruth.....	64
Dequiedt Vianney.....	38

Di Falco Salvatore.....	62
Diemer Arnaud.....	83
Dupuy Louis.....	80
Dutta Monica.....	29
Feres Jose.....	36
Ferrari Sylvie.....	72
Filisetti Alessandro.....	77
Fodha Mouez.....	22
Fouré Jean.....	45
Galiegue Xavier.....	65
Garcia Serge.....	63
Gemenne François.....	3
Generoso Rémi.....	2
Giovannetti Giorgia.....	15
Goeschl Timo.....	17
Guillaumont Patrick.....	7
Guimbard Houssein.....	45
Guo Huanxiu.....	34
Guta Dawit.....	54
He Jie.....	59, 82
Hemtanon Wittawat.....	51
Hervieux Marie-sophie.....	70
Ho Raúl.....	8
Hotte Louis.....	52, 81
Hu Yukun.....	27
Huang Desheng.....	21
Hubert Marie-helene.....	67
Iglioni Danilo.....	12
Jacquemin Johan.....	82
Jeong Yujin.....	40
Kambhampati Kavi Kumar.....	5
Kinda Somlanare.....	26
Kontoleon Andreas.....	57
Lange Mareike.....	64, 75
Lapeyre Renaud.....	18
Lasserre Pierre.....	43
Le Velly Gwenolé.....	53
Lizal Lubomir.....	24

Lohano Heman.....	6
Loyal Lare Amandine.....	32
Majda Seghir.....	66
Marchand Sébastien.....	34
Martin Jean-christophe.....	58
Martine Visser.....	20
Maurel Mathilde.....	7
Mehra Meeta.....	11, 29
Meless Yves.....	82
Menkyna Fusako.....	23
Milan Andrea.....	8
Millock Katrin.....	4
Molina Vale Petterson.....	60
Monjon Stéphanie.....	45
Motel Combes Pascale.....	61
Mukherjee Saptarshi.....	29
Muñoz-piña Carlos.....	53
Najman Boris.....	79
Narita Daiju.....	39
Neumärker Bernhard.....	37
Nikolas Gerber.....	54
Oberlack Christoph.....	37
Ouedraogo Boukary.....	72
Pallante Giacomo.....	55
Palmer Charles.....	62
Parsons Christopher.....	1
Pirard Romain.....	18
Poder Thomas.....	59
Point Patrick.....	42, 58
Pornpinatepong Kunlayanee.....	51
Pouchepparadjou Anandan.....	25
Poudou Jean-christophe.....	46
Poumanyvong Phetkeo.....	69
Quaas Martin.....	39
Raffin Natacha.....	10
Reis Eustaquio.....	36
Reis Eustáquio.....	60
Ritter Hendrik.....	48

Roussel Sébastien.....	46
Saelim Papitchaya.....	51
Sant'anna André.....	74
Sauquet Alexandre.....	28
Schmid Gisèle.....	44
Sebri Maamar.....	33
Seegmuller Thomas.....	10
Seneerattanaprayul Juntip.....	51
Setti Marco.....	77
Simonet Catherine.....	7
Sindhu Jayachandran.....	47
Stage Jesper.....	16, 19
Sundaravarathan Srinivasan.....	25
Ticci Elisa.....	15
Uwera Claudine.....	19, 31
Vardar N. Baris.....	13
Viswanathan Brinda.....	5
Wagner Natascha.....	41
Weidert Larissa.....	17
Weiner Robert.....	40
Weinhold Diana.....	60
Winands Sarah.....	30
Winer S L.....	81
Wolfersberger Julien.....	63
Wu Dan.....	14
Xie Xuxuan.....	57
Xu Jianhua.....	14
Yacouba Gnègnè.....	71
Yan Hui Jie.....	78
Zaghdoud Oussama.....	22
Zhang Shiqiu.....	14, 21, 57
Zhu Tong.....	14
Zoppoli Pietro.....	55

