ENERGY and ENVIRONMENTAL MODELING

EcoMod Conference

Moscow

September 13-14, 2007

Sponsored by:

ACADEMY OF NATIONAL ECONOMY

INSTITUTE FOR THE ECONOMY IN TRANSITION

EUROPEAN COMMISSION

FREE UNIVERSITY OF BRUSSELS (ULB)

Welcome

Dear Colleagues and Friends,

On behalf of the hosting country, the Academy of the National Economy, and the Institute of the Economy in Transition, I am honored to welcome you to the city of Moscow for the International Conference on Energy and Environmental Modeling. We would like to thank you for joining us at this conference, which gives us an outstanding opportunity to share our experience and knowledge and to expand our understanding of the most essential questions in this area.

The issues of the conference are extremely important. Considering the wide concern of global warming and increasing demand for energy, environmental and energy problems are of highest relevancy in all countries today. Our conference brings together researchers from the leading research centers and international organizations from all over the world. We hope that our fruitful collaboration will make a significant contribution to solving a number of problems.

I am especially glad that this conference takes place in our beautiful city. I hope you will have a chance to explore Moscow and will enjoy its unique architecture, historical places, and museums. We wish you an enjoyable stay and fruitful discussions.

Welcome to Moscow!

Vladimir Mau
Rector of the Academy of the National Economy under the Government of the Russian Federation
Member of the Scientific Committee

Conference Timetable:

Session	Session A	Session B	Session C	Session D
Room	A	B	C	D
	Thursday September 13th			
08:30 - 09:00	Registration			
09:00 - 09:15	Welcome and Opening Session			
09:15 - 10:30	Plenary Session			
10:30 - 11:00	Refreshment Break			
11:00 - 12:30	Climate Change, Kyoto and Post-Kyoto Issues	Electricity Market Modeling	General Equilibrium Modeling	R&D and Technological Change
12:30 - 14:00	Lunch Break			
14:00 - 15:30	Climate Change, Kyoto and Post-Kyoto Issues	Electricity Market Modeling	General Equilibrium Modeling	Transportation Sector Modeling
15:30 - 16:00	Refreshment Break			
16:00 - 17:30	Energy Demand and Supply Modeling	Energy and Environmental Taxation	Permits and Regulation	
18:00 - 20:00	Welcome Reception			
	Friday September 14th			
09:00 - 10:30	Policy Panel			
10:30 - 11:00	Refreshment Break			
11:00 - 12:30	Developing Countries	Energy and Macroeconomic Performance	Energy and Environmental Taxation	Renewable Energy Modeling
12:30 - 14:00	Lunch Break			
14:00 - 15:30	Miscellaneous	Regional and Urban Modeling	Energy and Environmental Taxation	Transportation Sector Modeling
15:30 - 16:00	Refreshment Break			
16:00 - 17:30	Developing Countries	Energy Demand and Supply Modeling	Energy and Environmental Taxation	Natural Gas Transmission and Distribution Modeling
20:00 - 23:00	Gala Dinner			

CONFERENCE ROOMS

The sessions will take place in the following rooms:

Session A: Room A
Session B: Room B
Session C: Room C
Session D: Room D

Refreshment breaks will take place next to the conference rooms

Lunches will take place at the Academy's restaurant

SOCIAL PROGRAM

Thursday, September 13th

18:00 – 20:00 Welcome Reception

Friday, September 14th

20:00 – 23:00 Gala Dinner

Thursday September 13th

08:30 – 09:00 Registration

09:00 – 09:15 Welcome and Opening Session

Sergey SINELNIKOV-MURYLEV, Vice Rector of ANE and Deputy Director of IET

Ali BAYAR, President of EcoMod

09:15 – 10:30 Plenary Session

Chair: Denise Eby KONAN

Truong TRUONG, Hiroshi HAMASAKI, Claudia KEMFERT
Nuclear Energy, CDM, and Climate Policy

Oleg LUGOVOY, Alexander GOLUB, Inna GRITSEVICH
Application of TIMES Model for Russian Post2012 Climate Policy Scenario

10:30 – 11:00 Refreshment Break

11:00 – 12:30 Parallel Sessions

Session A: Climate Change, Kyoto and Post-Kyoto Issues (Room A)

Chair: Ignacio PEREZ

Ana-Maria BOROMISA, Anamarija FARKAS, Sanja TISMA
Administrative Incentives for Alignment with Kyoto Protocol

Kenichi MATSUMOTO
Multi-Agent Model to Analyze CO2 Emissions Trading

Ignacio PEREZ, Karin HOLM-MÜLLER, Wolfgang BRITZ
Modelling a Trading Scheme for Greenhouse Gas Emissions from European Agriculture. A Comparative Analysis Based on Different Policy Options

Session B: Electricity Market Modeling (Room B)

Chair: Corinne CHATON

Per Bjarte SOLIBAKKE
Describing the Phelix Forward Electric-Power Market. A Stochastic Volatility Model Approach

Ahlem DAKHLAOUI
Dynamic Games in the Wholesale Electricity Market

Corinne CHATON, Marie-Laure GUILLERMINET, Cécile BAZART
Optimal Design of Electricity Generation Industry under Deregulation and Support to Renewable Energies

Session C: General Equilibrium Modeling (Room C)

Chair: Makena COFFMAN

Daniela BACCHI BARTHOLOMEU, Luciana Torrezan SILVEIRA
Impacts of the National Biodiesel Program on the Brazilian Economy: an Application of the Minimal Model of General Equilibrium

Sergey PALTSEV, John REILLY
Long-Term Energy Scenarios for Asia

Makena COFFMAN, Denise Eby KONAN, Jian ZHANG
Holding Visitors Accountable: The Impact of Tourism on Global Climate Change

Session D: R&D and Technological Change (Room D)

Chair: Oleg LUGOVOY

Francesco RICCI
Resource Conservation and Directed R&D as Strategic Complements

Fatih KARANFIL, Bilge OZTURK
Energy saving technical progress: How about the Solow Model

Alexander GOLUB, Elena STRUKOVA, Oleg LUGOVOY
Real Option Analysis of Response to Climate Policy under Uncertain Endogenous and Exogenous Technological Progress

12:30 – 14:00 Lunch Break

14:00 – 15:30 Parallel Sessions

Session A: Climate Change, Kyoto and Post-Kyoto Issues (Room A)

Chair: Vera KONONOVA

Maria GARCIA-FLECHA, Nuria OSES-ERASO
Cost Sharing Rules and International Climate Policy

Kenichi MATSUMOTO
Analysis of International Emissions Trading System Applying Multi-Agent Model

Vera KONONOVA, Natalia CHURKINA
Firms´ Adaptation to Climate Change: What Does a Hotter World Means for Business

Session B: Electricity Market Modeling (Room B)

Chair: Thure TRABER

Evgeniy POGREBNIAK, Derek BUNN
Simulated Energy Market Performance and Generator Solvency in Russian Wholesale Electricity Market under NOREM

Francesco GULLI, Liliya CHERNYAV'SKA
Modelling CO2 Price Pass-Through in Imperfectly Competitive Power Markets

Thure TRABER, Claudia KEMFERT
Future European Electricity Technologies under Emission Trading: The Potential Role of Fossil Fuels and Carbon Capture and Sequestration (CCS)

Session C: General Equilibrium Modeling (Room C)

Chair: Andreas LÖSCHEL

Olga DIUKANOVA
Alternative Options for the Design of Carbon Emissions

Marcel ZÜRN, Robert KÜSTER, Ingo ELLERSDORFER, Ulrich FAHL
R&D Investments and Knowledge Input in a Technology Oriented CGE Model

Andreas LÖSCHEL, Vincent M. OTTO
Technology Shocks and Directed Environmental Policy - The Case of CO2 Capture and Storage

Session D: Transportation Sector Modeling (Room D)

Chair: Graziano ABRATE

Luca RIGAMONTI, Pirani ALBERTO, Anna GAVIGLIO, Martina LICITRA PEDOL
Partial Utility of the Biofuels Use in the Public Transport

Pierrre KOPP, Rémy PRUD'HOMME
The Stockholm Toll : an Economic Evaluation

Graziano ABRATE, Massimiliano PIACENZA, Davide VANNONI
The Impact of Integrated Tariff Systems on Public Transport Demand: Evidence from Italy

15:30 – 16:00 Refreshment break

16:00 – 17:30 Parallel sessions

Session A: Energy Demand and Supply Modeling (Room A)

Chair: Denise Eby KONAN

Oscar DE-JUAN
A "Clakesh" AGE Model for Forecasting Energy Demand in Spain"

Stefan BOETERS
Autonomous Energy Efficiency Increases and the MAC in Long-Term Energy-Economy Scenarios

Oxana MAYOROVA
Forecasting of Demand and Supply for Fuel and Energy Resources on basis of balance modelling

Denise Eby KONAN, Jian ZHANG
China's Energy Quest in Global Energy Market

Session B: Energy and Environmental Taxation (Room B)

Chair: Cristina MOHORA

Grant ALLAN, Peter McGREGOR, Kim SWALES, Karen TURNER
The UK Climate Change Levy and the Potential for Double-Dividend Effects under Different Labour Market Specifications: a Computable General Equilibrium Analysis for the United Kingdom

Laia PIÉ DOLS, Maria LLOP LLOP
Economic Impact of Alternative Policy Measures Implemented on the Energy Activities of the Catalan Production System: an Input-output Analysis

Cristina MOHORA, Ali BAYAR, Frédéric DRAMAIS, Masudi OPESE
Regional Effects of Carbon Taxes in Belgium

Session C: Permits and Regulation (Room C)

Chair: Victoria UMANSKAYA

Ralf LÖSCHEL
Optimal Allocation of EU Emission Allowances under Imperfect Competition

Joshua Mathew ANUJ, Bouwe DIJKSTRA, Arijit MUKHERJEE
Environmental Regulation: An Incentive for Foreign Direct Investment

Victoria UMANSKAYA, Charles MASON, Edward BARBIER
Dynamic Game of Transboundary Pollution Regulation and Strategic Abatement

18:00 – 20:00 Welcome Reception

Friday, September 14th

09:00 – 10:30 Policy Panel

Andrey BELOUSOV, Ministry of Economic Development and Trade

Arkady DVORKOVICH, Ministry of Economic Development and Trade

Andrey GORKOV, RAO United Energy System

Vladimir MAU, Academy of National Economy of the Government of the Russian Federation

Lucio VINHAS DE SOUZA, European Commission

10:30 – 11:00 Refreshment break

11:00 – 12:30 Parallel Sessions

Session A: Developing Countries (Room A)

Chair: Hans KREMERS

Kenichi MATSUMOTO
Potential Role of Developing Countries on the Climate Change Policy from the Viewpoint of Participation -in the Concept of Multi-Agent Framework

Engin SORHUN
Oil Boom, Chewing-Gum, and Oil Fund

Hans KREMERS, Harold HOUBA
Bargaining for an Efficient and Fair Allocation of Emission Permits to Developing Countries

Session B: Energy and Macroeconomic Performance (Room B)

Chair: Lucio VINHAS DE SOUZA

Makena COFFMAN
Oil Price Shocks and Hawaii´s Economy: an Analysis of the Oil Price-Macroeconomy Relationship

Gürkan KUMBAROGLU
The Costs of Mitigating Carbon Emissions in Turkey: Findings from the BU-MACRO Model

Lucio VINHAS DE SOUZA, Tatiana LYSENKO
The effects of energy price shocks on growth and macroeconomic stability in selected energy-importing CIS countries

Session C: Energy and Environmental Taxation (Room C)

Chair: Azusa OKAGAWA

Ronaldo SEROA DA MOTTA
Water Charges for Forest Protection in Brazil

Fatih KARANFIL, Bilge OZTURK
Optimal Enforcement Policy and Firm´s Decisions on R&D and Emissions

Azusa OKAGAWA, Kanemi BAN
Evaluation of Carbon Abatement Policies with Assistance to Carbon Intensive Industries in Japan

Session D: Renewable Energy Modeling (Room D)

Chair: Bernhard HASCHE

Alexander KOLOVOS, George CHRISTAKOS
Stastical Tools in Renewable Energy Modeling: Physical Based, Non-Separable Spatiotemporal Covariance Models

Ulrike LEHR, Marlene KRATZAT
Renewable Energy and Employment in Germany

Bernhard HASCHE, Rüdiger BARTH, Derk Jan SWIDER
Effects of Improved Wind Forecasts on Operational Costs in the German Electricity System

12:30 – 14:00 Lunch Break

14:00 – 15:30 Parallel Sessions

Session A: Miscellaneous (Room A)

Chair: Ronald RIPPLE

Matthias FISCHER, Christian KÖCK
Multivariate Copula Models at Work: Dependence Structure of Energie Prices

Aitor CIARRETA, Ainhoa ZARRAGA
Electricity Consumption and Economic Growth: Evidence from Spain

Ronald RIPPLE, Imad A. MOOSA
Crude Oil Futures Price Volatility: the Effect of Maturity, Trading Volume, and Open Interest on Range-Based Volatility

Session B: Regional and Urban Modeling (Room B)

Chair: Lyubov KURKALOVA

Benoit LEFEVRE
Urban Transport Energetic Signature

Yuko MOTOKI, Hiroyuki KOSAKA
Local Energy Planning for Japanese Municipalities: Modeling and Comparison

Lyubov KURKALOVA, Catherine L. KLING
Responsiveness of Conservation Tillage Use to Changes in Energy Prices: Empirical Assessment for the Upper Mississippi River Basin

Session C: Energy and Environmental Taxation (Room C)

Chair: Maria de las Mercedes DE MIGUEL CABEZA

Jakob WINSTRAND
Hedonic Valuation of Health Risks Due to Residential Radon

Xavier PAUTREL
Environmental Policy, Health and Long-Run

Maria de las Mercedes DE MIGUEL CABEZA
The Use of Overlapping Economic Instruments in Carbon Emissions Regulation in a Small Economy

Session D: Transportation Sector Modeling (Room D)

Chair: Dominika KALINOWSKA

Daniela BACCHI BARTHOLOMEU, José Vicente CAIXETA FILHO
Quantifying of the Economic and Environmental Impacts Deriving from Brazilian's Highways State of Conservation

Brant LIDDLE
Long-Run Relation among Motor Fuel Use, Vehicle Miles Traveled, Income, and Gas Price for the US

Dominika KALINOWSKA, Hans KREMERS, Truong TRUONG
An Assessment of Road-Pricing Measures on Household Travel Demand in Germany using a Computable General Equilibrium Framework

15:30 – 16:00 Refreshment break

16:00 – 17:30 Parallel Sessions

Session A: Developing Countries (Room A)

Chair: Fatih KARANFIL

Sajjad MUBIN, Uree Afanosovich GARIYAINOV
Risk Analysis and Modeling of Contruction and Operation of Oil and Gas Pipelines in Pakistan

Sushila KAUL
Bio-Economic Modelling of Climate Change on Crop Production in India

Fatih KARANFIL, Thomas JOBERT
Sectoral Energy Consumption by Source and Economic Growth: The Case of Turkey

Session B: Energy Demand and Supply Modeling (Room B)

Chair: Abdul QAYYUM

Sergey SIVAEV, A. YU RODIONOV
Forecast of Energy Consumption in Housing Sector of Russia

Farshad NASROLLAHI
Effect of Architecture on Building Energy Demand in Cold Climates

Abdul QAYYUM, Muhammad Arshad KHAN
Energy Demand in Pakistan

Session C: Energy and Environmental Taxation (Room C)

Chair: Knud MUNK

Wiepke WISSEMA, Rob DELLINK
Analysis of Alternative Model Specifications in a CGE model for Carbon Tax Policy Analysis in Ireland

Keshab Raj BHATTARAI
Capital Accumulation, Growth and Redistribution: General Equilibrium Impacts of Energy and Pollution Taxes in UK

Knud MUNK
Administrative costs, public production and optimal taxation

Session D: Natural Gas Transmission and Distribution Modeling (Room D)

Chair: Marina TSYGANKOVA

Laure DURAND-VIEL
Strategic Storage and Market Power in the Natural Gas Market

Irina SULEYMANOVA, Franz HUBERT
Strategic Investment in International Gas-Transport Systems: A Dynamic Analysis of the Hold-up Problem

Marina TSYGANKOVA
The Export of Russian Gas to Europe: Breaking Up the Monopoly of Gazprom

20:00 – 23:00 Gala Dinner

ABSTRACTS

The Impact of Integrated Tariff Systems on Public Transport Demand: Evidence from Italy

Graziano ABRATE, Massimiliano PIACENZA, Davide VANNONI

The increasing problems of pollution and traffic congestion represent a challenge towards the definition of a model of sustainable mobility, in particular in the largest urban areas. An indirect control on these negative externalities associated with private transport may be pursued by means of policies aiming at improving quality and accessibility of public transit networks. In this respect, one popular option is to design an Integrated Tariff System (ITS): the crucial question remains if such a policy can be effective in raising the number of public transport users. In this study we use a ten-years panel of 69 Italian public transit providers (with or without ITS) and estimate alternative specifications of the demand function. Results show that the impact due to the ITS introduction is on average quite small, but it becomes more relevant when the ITS is characterized by specific factors such as large network extension, single ticket option and zonal pricing.

The UK Climate Change Levy and the Potential for Double-Dividend Effects under Different Labour Market Specifications: a Computable General Equilibrium Analysis for the United Kingdom

Grant ALLAN, Peter MCGREGOR, Kim SWALES, Karen TURNER

The “double-dividend” literature has developed from theoretical analysis to empirical tests. This literature is concerned with the question of whether revenue-neutral substitution of income taxation for environmental taxes can result in an environmental improvement and a reduction the costs of the tax system. Recent empirical tests have argued that the nature of the tax system and the assumed flexibility of the labour market are important for the possibility that a double-dividend might result. In this paper we examine an energy tax introduced in the UK – the Climate Change Levy. This tax is revenue neutral, with the tax income recycled through lower employers’ Social Security contributions. We use a Computable General Equilibrium model to investigate the sectoral and macroeconomic effects on the UK economy. A number of alternative specifications for the labour market are considered, as are the impacts of these for the existence of a double-dividend.

Environmental Regulation: An Incentive for Foreign Direct Investment

Joshua Mathew ANUJ, Bouwe DIJKSTRA, Arijit MUKHERJEE

Empirical evidence has so far failed to confirm that lenient environmental regulation attracts investment from polluting firms. We show that a firm may want to relocate to a country with stricter environmental regulation, when the move raises its rival´s cost by sufficiently more than its own. We model a Cournot duopoly with a foreign and an incumbent domestic firm. When the foreign firm moves to the home country, the domestic government will respond by moving the environmental tax rate. This may hurt the domestic firm more than the foreign firm. The home (foreign) country´s welfare is (usually) lower with FDI.

Quantifying of the Economic and Environmental Impacts Deriving from Brazilian’s Highways State of Conservation

Daniela BACCHI BARTHOLOMEU, José Vicente CAIXETA FILHO

Due to the importance of the road transportation for the Brazilian economy related to its participation in the matrix of load transport, to its high share in the fossil fuels consumption (diesel) and in the CO2 emissions, this study evaluated if highways in better state of conservation imply in economic and environmental benefits. The economic benefits were related to the evaluation of the following parameters: fuel consumption, duration of the trip and expenses on vehicle maintenance. The environmental benefits were related to the CO2 emissions reduction. They were collected primary data related to the performance observed in trucks (Volvo FH12 truck, manufactured in 2004), during a total of 48 trips along highways with different infrastructure conditions. The results showed the existence of economic and environmental benefits deriving from trips in routes with better infrastructure and a gain in energy efficiency, resulting in less fuel consumption and lower levels of CO2 emissions.

Impacts of the National Biodiesel Program on the Brazilian Economy: an Application of the Minimal Model of General Equilibrium

Daniela BACCHI BARTHOLOMEU, Luciana Torrezan SILVEIRA

This study aims to analyze the impact of the Biodiesel Program on the Brazilian economy, especially on the sectors of vegetable oil, diesel, sugar and ethanol. A simplified model of General Equilibrium (MINIMAL) is used, with data from the Input-Output Matrix of 1996. Two simulations are carried out: addition of 2% and 5% of biodiesel to the diesel. The results indicate that the increase of ethanol demand has greater impact on the sectorial and macroeconomic results, even though the shock in this sector is percentile lesser. As for employment, the effects are positive for the sectors, however the level of general job decreases, as well as the real GDP. It is verified also a decrease in the imports of the oil refining sector, but a rise in the total imports of economy. It can be concluded that the program of biodiesel can bring economic benefits, however in the sectors directly involved in the program. For the Brazilian economy as a whole, the benefits are not as expressive as expected.

Capital Accumulation, Growth and Redistribution: General Equilibrium Impacts of Energy and Pollution Taxes in UK

Keshab Raj BHATTARAI

The capital accumulation across sectors generates higher rates of economic growth across sectors but also raises the level of pollution. Growth and redistribution are analysed simultaneously with optimising households facing environmental taxes. The pollution taxes on the use of capital and labour inputs in production across sectors link the energy, environment and growth of economy where air, water, land pollution is essentially a by-product of processes of production. How the economy differs with and without energy and pollution taxes is shown using dynamic series of model results on output, employment, investment and capital stocks by sectors and households at micro level and corresponding aggregates at the macroeconomic level with a conclusion that the mechanism of pollution control should rely on energy saving or energy efficiency measures than on the energy and environmental taxes to let economy move in the balanced growth path.

Autonomous Energy Efficiency Increases and the MAC in Long-Term Energy-Economy Scenarios

Stefan BOETERS

Increases in autonomous energy e¢ ciency (AEEI) are the usual means to calibrate energy-economy models to exogenous time paths of energy intensity. This makes it necessary to introduce a compensatory amount of capital to stabilise output prices. The modeller is left with several options where to place his additional capital input in the production function and how to choose the relevant elasticities of substitution. In this paper, several such options are presented, and their consequences for the marginal abatement cost (MAC) curve are esplored. By an appropriate choice of the model setup, it is easily possible to generate either a steeper or flatter MAC curve. As a cautious approach to empirical modelling, a setup that leaves the shape of the MAC unchanged compared to the case of no AEEI is suggested.

Administrative Incentives for Alignment with Kyoto Protocol

Ana-Maria BOROMISA, Anamarija FARKAŠ, Sanja TIŠMA

In the period 1995-2002 average annual growth of CO2 emission in Croatia was 3.3%. This trend should be stopped in order to meet Kyoto obligations. Administrative measures aimed for alignment with Kyoto Protocol provide incentives for investments in environmental protection. The paper analyses proposed measures, with emphasis on provisions enabling reducing a fee for CO2 emissions depending on the level of investments in environmental protection. Preliminary cost-benefit analysis of different levels of investments in environmental protection and different starting levels of pollution is presented. Based on the analysis potential effectiveness of proposed measures is examined.

Optimal Design of Electricity Generation Industry under Deregulation and Support to Renewable Energies
Corinne CHATON, Marie-Laure GUILLERMINET, Cécile BAZART, Marie-Laure GUILLERMINET

This paper deals with the decision to invest in power generation units under gas emissions constraints and deregulation. This is a model of optimal expansion and investment planning.Producers (the incumbent and an entrant) operate plants according to a merit order rule and have to take into account an environmental constraint. The environmental measure could be alternatively: guaranteed price vs. green certificates, each system having impact that is modelled on the generation mix. Both firms keep some degree of flexibility in the programming of their equipments in an uncertain context. The acceptance of the project is conditional to the result of the optimization program. The model provides an analysis of the impact of the investment decision on generators profits, the surplus of consumers and at an aggregated level the collective welfare effect of the design of the generation park. It also provides a comparison of the weight two environmental tools can have in such a choice.

Electricity Consumption and Economic Growth: Evidence from Spain
Aitor CIARRETA, Ainhoa ZARRAGA

The paper investigates both linear and nonlinear causality between electricity consumption and economic growth in Spain for the period 1971-2005. We use the methodology of Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996). We also apply the standard Granger causality tests in a VAR for the series in first differences to achieve stationarity. The results are similar with both methodologies, which shows their robustness. We find unidirectional linear causality running from electricity consumption to real GDP. On the contrary, we find no evidence of nonlinear Granger causality between the series in either direction.

Oil Price Shocks and Hawaii´s Economy: an Analysis of the Oil Price-Macroeconomy Relationship
Makena COFFMAN

This study seeks to clarify the oil price-macroeconomy relationship within a small open economy using a computable general equilibrium model for Hawai`i. Hawai`i is an illustrative example because it is the most relatively oil dependent State in the U.S. A range of oil price increases are analyzed to determine the economy's ability to absorb oil price shocks as well as sector-level effects. The model shows that although oil price increases have substantial inflationary effects and negative productivity effects, there are also deflationary aspects of incremental oil price increases because of changes in consumer demand and a reduction in real visitor expenditures. The deflationary effect accounts for the counter-intuitive result that households are made better-off under small oil price increases. The "threshold" for Hawai`i's economy to absorb oil price shocks is around a 30% increase in world oil prices.

Dynamic Games in the Wholesale Electricity Market
Ahlem DAKHLAOUI

In this paper, we deal with mixed hydro-thermal system operating problems under Cournot closed-loop game and Stackelberg closed-loop game.Under Cournot closed-loop game, we show that traditional principle of least-cost operation is inverted at the binding capacity constraint of thermal operator. Under Stackelberg closed-loop game, we show that thermal operator can restrict the hydraulic output without compensation. The technical complementarities and Stackelberg competition distorted the tradional quot merit order quot; operating principle.

The Use of Overlapping Economic Instruments in Carbon Emissions Regulation in a Small Economy
María de las Mercedes DE MIGUEL CABEZA

During the last years several Spanish regions have introduced pollutant emission taxes. In Aragon, a tax on CO2 emissions coexists with the European Emission Trading Scheme. By means of a computable partial equilibrium model, the present paper compares the costs generated by the reduction of CO2 emissions as established at the European Burden Sharing Agreement in four policy mix scenarios. In the first scenario the emission reduction is reached only by an emission trading system in which all economic sectors participate. The second one represents the present European system, which covers only some sectors. In the third scenario the Aragon's tax is introduced together with the European Emission Trading Scheme. Finally the fourth scenario provides the tax rate that would lead to an efficient solution in the presence of the European Emission Trading Scheme.

A "Clakesh" AGE Model for Forecasting Energy Demand in Spain
Oscar DE-JUAN

The paper develops a "Clakesch" AGE model for the estimation of energy demand and applies it to the Spanish Economy. The theoretical roots of the model are a blend between the Classical, Keynesian and Schumpeterian traditions (therein the acronym "Clakesch"). It is an "Applied General Equilibrium" (AGE) model, where prices may influence quantities and vice versa. The influence is rather low (as we observe in practice and the Clakesch tradition predicts). Yet, it may be significant concerning energy demand. The amount and composition of energy demand depends mostly on: (a) the overall rate of growth of the economy (b) the type of growth, i.e. the industries playing the role of locomotives; and (c) relative prices of the alternative sources of energy. The model is dynamic in nature since output and technology are changing at a specific rate, although this rate may be altered by a variety of shocks. It is a mixed input-output econometric model. Econometrics provides the elasticities used to compute broad input-output multipliers. These multipliers a broad ones, since they derive from a SAM which introduces the household sector as an additional "industry".

Alternative Options for the Design of Carbon Emissions
Olga DIUKANOVA

It is well known that for Ukraine, which is known as the one of the biggest potential sellers of emission rights on the international GHG market, compliance with the Kyoto target does not represent a cost issue but an opportunity for restructuring of its inefficient and carbon-intensive economy by providing initial capital for technology transfer and set up of eco-efficient enterprises. One of the most leading options for achieving both the cost-effective emission reduction and promoting energy efficiency is to implement the domestic emission-trading scheme. A major issue is how to arrange it? A computable general equilibrium model is used to substantiate the possible economic effect on energy- intensive industries under different allocation options of emissions permits.

Strategic Storage and Market Power in the Natural Gas Market
Laure DURAND-VIEL

We analyse strategic storage when both producers and marketers are oligopolistic, which yields original results compared to existing models with a single oligopoly. Storage has two opposite strategic effects: it decreases producers' market power but since this also benefits rival marketers, downstream competition increases. The intuition that strategic storage consists in pre-empting future demand (so that each firm wants to store more than her rival) is challenged when it exerts a positive externality on rivals: a marketer can prefer storing less than his rivals in order to benefit from a lower spot price in a high-demand period. We show that a marketer owning a storage unit has actually no interest to oppose third-party access, as increasing rivals' storage can be beneficial, while a producer is incited to deny access to storage to preserve his market power. Thus, control over storage should be of greater concern to regulators when the owner is a producer than when he is a marketer.

Multivariate Copula Models at Work: Dependence Structure of Energie Prices
Matthias FISCHER, Christian KÖCK

Since the pioneering work of Embrechts and co-authors in 1999, copula models enjoy steadily increasing popularity in finance. Whereas copulas are well-studied in the bivariate case, the higher-dimensional case still offers several open issues and it is by far not clear how to construct copulas which sufficiently capture the characteristics of financial returns. For this reason, elliptical copulas (i.e. Gaussian and Student-t copula) still dominate both empirical and practical applications. On the other hand, several attractive construction schemes appeared in the recent literature promising flexible but still manageable dependence models. The aim of this work is to empirically investigate whether these models are really capable to model differen sorts of exchange-traded energy prices.

Cost Sharing Rules and International Climate Policy

Maria GARCIA-FLECHA, Nuria OSES-ERASO

The Kyoto Protocol imposes different quantitative emissions ceilings on the industrialized countries and brings different costs and benefits. The problem faced in this agreement is similar to the one faced in many cooperative games: the distribution of a commodity according to a profile of claims. Therefore, our goal is to transform this general problem of cost and surplus sharing into an emissions problem where a given amount of emission permits must be divided among countries with unequal claims on the permits. We use the axiomatic approach of cooperative games to analyze the efficiency and equity of the distribution of emission ceilings. We construct distributional rules that fulfill all or some of the cooperative games' axioms. In addition, the axioms give some clues to analyze how a restriction in the number of permits can be implemented (the deepening of cooperation) and to study the incorporation of new agents to the treaty (the broadening of cooperation).

Modelling CO2 Price Pass-Through in Imperfectly Competitive Power Markets

Francesco GULLI, Liliya CHERNYAV´SKA

In line with economic theory, carbon ETS is expected to determine a rise in marginal cost equal to the carbon opportunity cost regardless of whether carbon allowances are allocated free of charge or not. Hence, in principle the impact of the ETS on power prices in imperfectly competitive markets should be lower than the carbon cost. By using the load duration curve approach and the dominant firm-competitive fringe model, the analysis proposed in this paper shows that this does not necessarily occur. The marginal pass-through rate can be more or less than 1 depending on several structural factors (market concentration, available capacity and the power plant mix in the market). The empirical analysis of the Italian market, which can be split in four sub-markets with different structural features, confirms the model estimates. Market power, therefore, can determines a significant deviation from the "full pass-through" rule but we can not know which is the sign of this deviation, a priori.

Effects of Improved Wind Forecasts on Operational Costs in the German Electricity System

Bernhard HASCHE, Rüdiger BARTH, Derk Jan SWIDER

The low predictability of wind power causes additional costs for the operation of electricity systems that integrate large amounts of wind energy. This is due to a higher demand for balancing power and short-term unit-commitment with more frequent part-load operation and start-ups. A simulation of short-term wind forecast errors in combination with a stochastic unit-commitment model for Germany allows examining these integration costs. The paper has three focuses. First, a statistical analysis of short term forecast errors based on real data and literature. Second, the generation of discrete forecast scenarios that fit to the found statistical parameters of real forecast errors and that are needed for the stochastic optimization in an unit-commitment model. Third, discussion of results of the latter model with different assumptions of forecast qualities. This finally allows deriving operational cost reductions in the German electricity system due to improved wind forecast techniques.

An Assessment of Road-Pricing Measures on Household Travel Demand in Germany using a Computable General Equilibrium Framework

Dominika KALINOWSKA, Hans KREMERS, Truong TRUONG

The transportation sector relies heavily on the use of fossil fuels and therefore creates negative externalities on the rest of the economy. Prices do not correctly reflect this sector's social costs. Currently, the EU and in particular Germany, debates the possible implementation of road-pricing measures for passenger transport. We describe the modification of the Austrian Road Pricing Model (ARPM) in order to construct a computable general equilibrium model and a database for Germany with a detailed description of passenger travel demand. The objective is to assess the impact of road pricing measures on household travel demand under different assumptions with respect to the redistribution of road pricing revenues. To account for the distributional effects of road pricing in the transportation sector, we introduce different household categories distinguished according to income categories and residential location.

Sectoral Energy Consumption by Source and Economic Growth: The Case of Turkey
Fatih KARANFIL, Thomas JOBERT

This paper provides a brief summary of economic development while analyzing in detail energy consumption in Turkey during the last forty years.It investigates the causal relationship between income and energy consumption in two ways.First, it distinguishes between different categories of energy consumption: industrial, residential and total energy consumption.Second, the growth of different sources of energy consumption is analyzed in order to capture any difference in behaviour of the linkage between income and energy consumption among various sources.Previous findings suggest that in Turkey, there is a unidirectional causality running from energy consumption to growth.In contrast, we find no evidence of long run relationship and energy and income appear to be neutral with respect to each other.The analysis shows also strong evidence of instantaneous causality between these variables.These results imply that energy conservation policies do not impede economic growth in the long term.

Energy Saving Technical Progress: How About The Solow Model?
Fatih KARANFIL, Bilge OZTURK

This paper attempts to make an analysis of the different effects of the direction of technical change on share of energy in the national income. We extend the standard Solow Model by adding the energy factor and allowing for technical progress induced by biased R&D activities. For determining the direction of technical change we use Kennedy´s modified innovation possibilities frontier. The rate of capital augmenting technical progress is ex ante determined. Based on this, firms decide on the share of expenditures in labour augmenting technical progress, b, and the rate of energy augmenting technologies is a function of b. The energy demand in this model depends on the depreciation rate of capital. We show that neutral technical change is a necessary condition for the stability of share of energy. We point out also that the impact of the marginal propensity to save and the depreciation rate of capital is negative on capital and labour prices whereas it is positive on energy price.

Optimal Enforcement Policy and Firm´s Decisions on R&D and Emissions
Fatih KARANFIL, Bilge OZTURK

We develop an environmental regulation model with asymmetric information where the enforcement mechanism is designed based on emission reports chosen by firms and emission signals that the enforcement agency receives. We consider two cases: first firms choose their emission levels and reports second we include technological progress increasing production and abating emissions. We compare the equilibrium results under imperfect monitoring where the enforcement agency uses two different mechanisms with the perfect monitoring results. The enforcement mechanism using the gap between emission signals and reports gives the same results as the perfect monitoring case whereas if only emission signals are taken into account we obtain better results compared with the perfect monitoring case: emissions are reduced, investments increase. Truthful revelation requires the first mechanism but if the enforcement agency is concerned with the social welfare the second mechanism should be chosen.

Bio-Economic Modelling of Climate Change on Crop Production in India
Sushila KAUL

In India, climate change is expected to make an impact in agriculture, resulting in lower yields of crops. The objectives of this paper are to examine production and profits under different climatic scenarios, to study area allocation under different crops with varying resource endowments, and examine process of adaptation by farmers under extreme climatic conditions. Climate response functions using EPIC crop growth models would be estimated using climate, edaphic, economic and weather variables to examine the impact of climate change on productivity and resource use. Time-series data for last 30 to 40 years will be analyzed. The impact of weather variables will be examined on important crops. Study will be confined to two areas-one which is drought prone and the other which is flood prone. The adaptation made by farmers in the event of flood and drought will be examined. This will provide an insight in optimization of resource use including land allocation to various crops.

Stastical Tools in Renewable Energy Modeling: Physical Based, Non-Separable Spatiotemporal Covariance Models

Alexander KOLOVOS, George CHRISTAKOS

Covariance functions are powerful statistical tools for the understanding and analysis of the variability and uncertainty in natural systems. The category of non-separable spatiotemporal covariances offers advanced options and added flexibility in modeling the joint space/time structure of real-world processes that lie in the heart of renewable energy modeling. This work offers a review of covariances generated from physical models alongside with visual representations for the illustration of their characteristic features. In addition, methods are presented to further develop and expand the collection of such functions.

China's Energy Quest in Global Energy Market

Denise Eby KONAN, Jian ZHANG

Increasing imports of oil by China have raised concern about global oil security. Recent years, China's foreign policy has been strongly influenced by oil acquisition. Via computable general equilibrium modeling, we assess the impacts of global economic growth, Chinese currency appreciation on oil demand in the global market, especially China's oil import pattern. Our results show that the Middle East, South-East Asia and Sub-Sahara Africa regions would continue to dominate China's imported oil products market in the next several decades. Appreciation of Yuan would not change the import of oil pattern for China but intensify the volume of imports. Currently, China domestic energy supply provides about 94% of its total consumption. China's total energy import demand in the world market share will grow from 12 percent in 2010 to 17 percent in 2050. Half of China's oil demand will rely on import in the next fifty years if all things hold constant.

Holding Visitors Accountable: The Impact of Tourism on Global Climate Change

Denise Eby KONAN, Makena COFFMAN, Jian ZHANG

Visitors are attracted to Hawai'i's unparalleled beauty and fragile ecosystem, yet impose significant environmental impacts both locally and globally. Greenhouse gas emissions can be mitigated through visitor taxes, energy policy, and industrial measures. This model provides emissions (carbon dioxide, methane, and nitrous oxide) generated by residents, government, and five types of visitors in an applied general equilibrium model of Hawai'i's economy. The extensive Hawai'i dataset includes consumer and industry data for 131 sectors, ten agents, and six fossil fuel types. Simulation results are presented for macroeconomic indicators including visitor and household expenditures, price indices, income distribution, output, and gross state product. The model simulates various policy scenarios including a climate-neutral visitor tax.

Firms´ Adaptation to Climate Change: What Does a Hotter World Means for Business?

Vera KONONOVA, Natalia CHURKINA

The extensive research in economics of climate change has been focused on mitigation and to a lesser degree on adaptation. However, even in optimistic mitigation scenarios the stabilization levels of GHG concentrations will be higher than today. To certain extent, climate change is inevitable. In addition to adaptation efforts on government and international levels, selective action shall be undertaken by individual businesses. The paper summarizes existing research and empiric evidence of industry-specific climate change impact (including adaptation responses in Carbon Disclosure Project questionnaire) with a focus on deriving patterns of firm-level response strategies.

The Stockholm Toll : an Economic Evaluation

Pierre KOPP, Rémy PRUD'HOMME

The Stockholm toll causes, as predicted by theory, a reduction in traffic, leading to increased speeds, and to time gains for remaining car-users. These gains, calculated to be about +140 M. SEK per year, appear to be modest, much lower than similar gains estimated in London, because congestion was moderate and reducing it to its optimal level, which is what the toll achieves, does not represent massive time gains. The toll also causes a loss for evicted car-users, for about -60 M. SEK per year. It also produces environmental benefits, for an estimated +100 M SEK per year. A major cost is the implementation cost, about half the cost experienced in London, but nevertheless high at about -700 M SEK per year. Finally, the toll made it necessary in order to accommodate modal shifters to increase public transport supply, at a cost of -560 M SEK per year, although this increase in public transport supply was not sufficient to prevent an increase in public transport congestion tentatively estimated to be above 170 M SEK per year. Overall, costs outweigh the very real benefits of the toll by nearly 900 M SEK per year. For an urban toll to produce net benefits, it seems that three conditions are required: a relatively high degree of road congestion, a reasonably cheap implementation system, and a relatively low level of public transport congestion.

Bargaining for an Efficient and Fair Allocation of Emission Permits to Developing Countries

Hans KREMERS, Harold HOUBA

The paper focusses on the negotiations between the developed countries currently implementing emission permit markets versus the developing countries who want to join an this market. We model the negotiations according to the alternating offers bargaining model. The objective is to obtain an efficient and fair allocation of tradeable emission permits between these two players. At each period, one player proposes a feasible allocation of the goods. Then the other player ends the negotiations by accepting the proposal, or prolongs them by rejecting it. The proposal is accepted if this player considers it fair. If rejected, the next round is played with a certain probability and the other player making a proposal. The equilibrium concept in this model is that of a subgame perfect equilibrium. The paper is concluded with a comparison of the bargaining solution with several proposals, using the GTAP-E model as the reference model for the economy.

The Costs of Mitigating Carbon Emissions in Turkey: Findings from the BU-MACRO Model

Gürkan KUMBAROGLU

In this paper, BU-MACRO, an integrated energy-economy-environment model, is used to generate Turkey's reference projections of energy use and economic growth, and explore the costs of CO2 emission reduction. A Bottom-Up (BU) disaggregate activity analysis framework of the energy sector is combined with an aggregate representation of the macroeconomy (MACRO) by means of a nested CES production function. The model allows for both price-induced and autonomous energy conservation, energy efficiency improvement and for inter-fuel substitution. BU-MACRO accounts for emission reductions additional to the reference projections implied by RET installations, thus featuring an evaluation of emission certificate trading as defined under the Kyoto flexibility mechanisms. Results for a base case scenario as well as various other scenarios employing the same resource availability, macroeconomic and technology assumptions as in the base case, but considering different emission targets are discussed.

Responsiveness of Conservation Tillage Use to Changes in Energy Prices: Empirical Assessment for the Upper Mississippi River Basin

Lyubov KURKALOVA, Catherine L. KLING

The study proposes a methodology for estimating the responsiveness of conservation tillage use to changes in fuel prices. An integral component of the methodology is the explicit acknowledgment that there is an uncertainty in the estimates because of the uncertainty associated with the use of econometrically estimated models. The results of applying the method to a major crop production area, the Upper Mississippi River Basin in the central United States, are reported for two major crops in the region, corn and soybeans. The implications to carbon sequestration in agricultural soils are also considered. The approach proposed should be readily transferable to other geographic areas and conservation practices

Urban Transport Energetic Signature
Benoit LEFEVRE

The proposed Urban Transport Energetic Signature (UTES) evaluates the sustainability of the energetical urban systems. The first part of this article presents a critical survey of the existing indicators, with a special focus on the Ecological Footprint. It aims to understand why there is no consensus on one of them. The second part relates to two series of assumptions explaining the deadlock of the indicator construction and implementation. The third part explains how we answer to this deadlock: to lean back UTES on an existing integrated Transport-Land Use model (TRANUS) in order to improve the analytical capacity on the inter-relationship between the different parameters that determine the energy consumptions. A fourth chapter presents the implementation of UTES on the case of Bangalore, India. This study allow us to explore the efficiency of technological (end of pipe), pricing, public transport, land-use and combined policies to reduce energy consumptions and CO2 emissions.

Renewable Energy and Employment in Germany
Ulrike LEHR, Marlene KRATZAT

The positive impacts of an increasing share of renewable energies on the mitigation of climate change as well as on the decrease of the dependency of energy imports are indisputable. However, one persistent problem for the German economy has been its high level of unemployment in the recent past. Therefore, any policy strategy will be measured also by its net-impact on the labor market. The paper describes the results of a study that models this impact and is novel within three respects: Firstly, an Input-Output-Vector for the renewable energy sector was developed based on the results of more than 1000 interviews with an extensive questionnaire, secondly gross and net effect of two different policy scenarios for Germany until 2030 were calculated and thirdly the approach varies from earlier studies by its explicit modeling of export and foreign trade effects.

Long-Run Relation among Motor Fuel Use, Vehicle Miles Traveled, Income, and Gas Price for the US.
Brant LIDDLE

Energy used in transport is a particularly important focus for environment-development studies since it is increasing in both developed and developing countries and is a carbon-intensive activity everywhere. Gasoline price and per capita motor fuel consumption (and therefore CO2 emissions) are highly correlated, but it may be too simplistic to assume that higher prices will lead to lower use and emissions since there maybe a systemic relationship among price, technology, and mobility demand. This paper tests if such a systemic, co-integrated relationship exists among gasoline price, income, and both per capita motor fuel consumption and per capita vehicle-miles traveled using US yearly data from 1919-2004 and US quarterly data from 1973-2004 and the Johansen cointegration test. The paper's finding of a cointegrating relationship means that gasoline price, technology, and fuel consumption cannot be easily disentangled in the short-run.

Optimal Allocation of EU Emission Allowances under Imperfect Competition
Ralf LÖSCHEL

In an effort to regulate green house gas emissions the EU makes use of a hybrid approach, which differentiates between the industry, traffic, and households sector. A common assumption is that an optimal allocation of emissions in the European system must satisfy equal marginal emission abatement costs for emitters in all sectors. This paper investigates the impact of firms´ behavior on the costs minimizing allocation of emissions. It is shown that in case of oligopolies cost efficiency does not inevitably require equal marginal emission abatement costs across sectors. To achieve an optimal solution, marginal abatement costs of emitters in the industry sector must be above or below marginal costs of other emitters, depending on commodity market´s competition and emitters´ asymmetry. This has a direct impact on the optimal National Allocation Plan; e.g. an allocation favoring emitters from the industry sector over traffic and households can be necessary to minimize society's costs.

Technology Shocks and Directed Environmental Policy - The Case of CO2 Capture and Storage

Andreas LÖSCHEL, Vincent M. OTTO

In the environmental-economics literature, it is often assumed that technical change through e.g. incremental efficiency improvements is anticipated. In reality, however, the large uncertainties surrounding technical change cause most radical innovations to be unanticipated. This paper studies implications of unanticipated technical change for the design of environmental policy. For this purpose, we develop a dynamic general equilibrium model - calibrated for the Netherlands- that explicitly captures empirical links between CO2 emissions associated with energy use, endogenous technical change and the economy. Besides specifying incremental technical change trough investments in knowledge capital (innovation), its adoption (diffusion) and technology externalities, we introduce CO2 capture and storage as a radical CO2 abatement technology that becomes competitive at some point in the future.

Application of TIMES Model for Russian Post2012 Climate Policy Scenario

Oleg LUGOVOY, Alexander GOLUB, Inna GRITSEVICH

Paper presents major results of Russian energy sector modeling. TIMES was calibrated in Russian data and first was used to analyze the entire energy sector, with perspective for regionalization with more detailed description of electricity and district heat sector that is accountable for more than 1/3 of Russian CO2 emission. Reference case is computed using information of Russian technologies, while low carbon scenario assumes deployment of state of the art energy production technologies. We consider several policy scenarios that include domestic energy price policy, Russian participation in global carbon market and Russian policy on European natural gas market. The model demonstrates feasibility of long-term stabilization target of Russian carbon emission on 1990 level.

Real Option Analysis of Response to Climate Policy under Uncertain Endogenous and Exogenous Technological Progress

Oleg LUGOVOY, Elena STRUKOVA, Alexander GOLUB

The paper discusses various instruments to implement carbon policy such as emission tax, cap and trade, carbon intensity with regard to uncertain abatement cost and uncertain dynamic of endogenous and exogenous technological innovation. Analysis is based on a computed real business cycle model where firms response carbon constraints modeled using real option methodology. Most emphasis is to analyze cap and trade scenario with particular focus on carbon allowances prices dynamics. For illustration of methodology we calibrate the model to reproduce carbon price dynamics on EU carbon market and US SO2 market.

Multi-Agent Model to Analyze CO2 Emissions Trading

Kenichi MATSUMOTO

The purpose of this paper is to describe a multi-agent simulation model developed to analyze CO2 emissions trading. Generally, unlike traditional economic methods, multi-agent models make analyses of complex social systems such as emissions trading possible without strong assumptions which are far from reality. That is to say, there is possibility to simulate such systems under conditions close to the real world by using them. In the developed model, each micro-agent (region) decides how to behave using strategies and information of its own. Then, due to only interactions among the agents and among the agents and the macro-system (market), trades are realized. In the model, methods to trade and strategies of agents are particularly important. Because the model is constructed based on simple assumptions and frameworks, and only emissions trading can be analyzed, it is necessary to study methods to analyze IET by incorporating some realistic structures into the model.

Analysis of International Emissions Trading System Applying Multi-Agent Model
Kenichi MATSUMOTO

International emissions trading (IET) of CO2 considering the Kyoto Protocol is analyzed using a multi-agent model. Then, the results are compared with "no IET" and "theoretical IET". In the model, each region behaves as an independent agent and abates CO2 emissions with minimum cost through decision making between self-abatement and IET depending on its local information. In the trade, the bidding prices are decided using MAC functions and strategies, and the bidding amounts are decided using CO2 emissions and emissions rights. Although the results of each simulation are similar, the states of trading are continuously fluctuating. Also, it is revealed that the costs and the self-abatement amounts of developed regions become smaller, the profits and the self-abatement amounts of developing regions become larger, and the total cost becomes smaller due to IET assuming bounded rationality. However, these effects are far below those of the theoretical IET despite of the active trades.

Potential Role of Developing Countries on the Climate Change Policy from the Viewpoint of Participation - in the Concept of Multi-Agent Framework-
Kenichi MATSUMOTO

The potential role of developing countries (DC) on the climate change policy to abate CO2 emissions is proved quantitatively in the concept of multi-agent problem. It is evaluated from the frame of participation in the policy using a CGE model. It is assumed that all regions participate in it in the base and the abatement rates are identical to analyze in the equal standard. Then, the cases in which each region withdraws from it are compared in terms of emissions abatement, carbon leakages, and marginal abatement cost. Furthermore, sensitivity analysis about the rates is done to confirm the result.
It is revealed that nonparticipation of DC affects rather badly on the policy and it is concluded that the policy introduced in DC is efficient and effective, especially that in China. These are true for all the cases of the sensitivity analysis. For the policy implication, DC, especially China, should make some contribution to the climate change policy that will be renewed in near future.

Forecasting of Demand and Supply for Fuel and Energy Resources on basis of balance modelling
Oksana MAYOROVA

Regional Effects of Carbon Taxes in Belgium
Cristina MOHORA, Ali BAYAR, Masudi OPESE, Frédéric DRAMAIS,

The relation between environmental policies, especially carbon taxes, and employment has been one of the widely debated issues in Europe. One important element of green tax reform pursued in some countries has been to raise taxes or duties on fossil fuels whilst lowering them upon labor. Some economists argue that such shifts in tax burdens could provide a ‘double dividend’ in terms of (I) desired environmental improvements and (II) a boost to employment. Several studies conclude that the existence of such a double dividend is not conclusive (either from theoretical or empirical perspectives) and any dividend is likely to be achieved only if a number of fairly restrictive conditions were met. However, this line of research is limited to the “double dividend” impacts at the national or European level. In this paper, we extend the analysis to the regional level using the dynamic, interregional, multisectoral general equilibrium model GreenMod for Belgium.

Local Energy Planning for Japanese Municipalities: Modeling and Comparison
Yuko MOTOKI, Hiroyuki KOSAKA

Promoting renewable energy and rational energy use at local level is one of urgent subjects in Japan. This study demonstrates local energy planning using MARKAL model and discusses the energy demand and supply vision of Japanese municipalities of Hachinohe City, Kuzumaki Town, and Tokyo Metropolitan. Following scenarios are defined from the viewpoint of renewable energy utilization: the business as usual scenario and CO2 restriction scenario for 2030. The optimization is carried on considering the future economic growth, the improvement in energy intensity, the increase on the energy cost, and advancement of energy technologies. It will be indicated from this study that implementation of renewable energy at local level contributes to mitigate CO2 reduction, but without incentives the capacity isn’t sufficient to satisfy the surplus of future energy demand. The sustainability of local energy system should be realized by cooperation between local government and the national government.

Risk Analysis and Modeling of Contruction and Operation of Oil and Gas Pipelines in Pakistan
Sajjad MUBIN, Uree Afanosovich GARIYAINOV

Oil and gas sector is the most promising sector of Pakistan´s economy especially the construction of new oil and gas pipeline network. in Pakistan the expected investment on mega oil and gas pipeline projects is 5-7 billion US dollers. However there are a lot of risks accociated with the construction and exploitation of these pipelines. e.g. extreme weather conditions, frequency of natural disasters, terrorism, war and etc. the purpose of this research work is to identify, analyse and modeling of risks based on extreme weather conditions, possibility of natural disasters (earthquake, land slide and floods), possibilities of terrorism attacks, war and other technical factors. intended to use computer aided modeling tools to give an optimum solution for all above mentioned risk factors.

Administrative costs, public production and optimal taxation
Knud MUNK

Effect of Architecture on Building Energy Demand in Cold Climates
Farshad NASROLLAHI

In this research the effect of architectural factors in cold climates is investigated by buildings simulation with DesignBuilder. At first a general available building in Tabriz (Iran) is selected and its energy demand is calculated through energy modeling. Then some other buildings under the same conditions but with different architectural design are designed and simulated. All of these 30 different buildings are simulated and subsequently similar buildings, are compared with each other to find the architectural factors, which reduce the energy demand of buildings in cold climates. Simulation and analysis prove that, insulation of thermal envelope, use of insulated windows and air tightness of building will effectively reduce the energy demand of buildings (up to 77%) and architectural design has also a great effect on their energy consumption (up to 64%), which is rarely paid attention to.

Evaluation of Carbon Abatement Policies with Assistance to Carbon Intensive Industries in Japan
Azusa OKAGAWA, Kanemi BAN

The Japanese government must immediately introduce national CO2 abatement policy in compliance with the Kyoto protocol. However, the opposition from carbon intensive industries delay introduction of abatement policy because it will put a large burden on them. Therefore, the national CO2 abatement policy must be designed to reduce cost burden on industries, but, these policies may increase economy-wide abatement costs. This paper focuses on two forms of these policies; the carbon tax exemptions and the refund of carbon tax. We quantify the impacts of these policies on each industry and welfare costs using a multi-sectoral CGE model of the Japanese economy. The results show the assistances to carbon intensive industries lead to 28-99% higher marginal abatement costs and 0.01-0.07% welfare losses compared with the no assistance cases. Also, the results imply the refund of tax can largely mitigate adverse impacts on price of carbon intensive goods compared with the case of 50% exemptions.

Long-Term Energy Scenarios for Asia
Sergey PALTSEV, John REILLY

We develop and discuss several long-term scenarios of energy consumption for Asia and their energy markets and climate implications. We use the MIT Emissions Prediction and Policy Analysis (EPPA) model, a computable general equilibrium model of the world economy, that has been widely used to study climate change policy. We focus mostly on China. The results for Japan, India, Dynamic Asian regions, Australia and New Zealand are also discussed.

Environmental Policy, Health and Long-Run

Xavier PAUTREL

This paper investigates how environmental policy affects long-run economic growth focusing on the detrimental impact of pollution on health. Marrying environmental economics, health economics and the theory of growth, it demonstrates that environmental policy improves long-run growth for low levels of pollution tax but becomes detrimental for high levels. It also shows that, the more important is the harmful effect of pollution on health and the greater is the influence of health on productivity parameters, the more likely environmental policy will affect positively growth. These results remain valid when we consider other channels through which health affects growth and when we assume that agents invest scarce resources in health promoting activities. They call for an active policy to improve environmental quality.

Modelling a Trading Scheme for Greenhouse Gas Emissions from European Agriculture. A Comparative Analysis Based on Different Policy Options

Ignacio PÉREZ, Karin HOLM-MÜLLER, Wolfgang BRITZ

Modelling alternatives for the estimation of emission factors, definition of policy instruments for greenhouse gas emission abatement as well as measurement of their economic effects are at this stage quite important for the coming multilateral negotiations. With this purpose a modelling framework covering greenhouse gas emissions from agricultural sources is developed in the analysis at the regional level of physical and economic effects of the Kyoto Protocol agreement in European Agricultural. This modeling approach is based on the application of a permit trade scheme for emission abatement compared within the Kyoto 'first commitment' baseline. The effects derived of three alternative schemes are described in detail: unrestricted trade, the EU 'burden sharing' agreement option and intra-country restricted trade. The analysis shows how important is the combined selection of adequate instruments of emission abatement for the design of efficient emission reduction policies.

Economic Impact of Alternative Policy Measures Implemented on the Energy Activities of the Catalan Production System: an Input-output Analysis

Laia PIÉ DOLS, Maria LLOP LLOP

The aim of the paper is to analyse the economic impacts of alternative taxation policies implemented on the contaminant activities of the Catalan production system. Specifically, we analyse the effects of a tax on the final production of the pollutant activities and a tax on the intermediate uses of pollutants. The methodology involves two versions of the input-output price model: a competitive price formulation and a mark-up price formulation. The input-output price framework will allow to evaluate how the alternative measures modify production prices, consumption prices, and private welfare. The empirical application is for the Catalan economy through the use of economic data for the year 2001.

Simulated Energy Market Performance and Generator Solvency in Russian Wholesale Electricity Market under NOREM

Evgeniy POGREBNIAK, Derek BUNN

We assess thermal generators' performance in a competitive energy market using plant-level production cost estimates and annual hourly load data in a simulation with realistic representation of mandatory load rules treated as bilateral forward cover contracts. In a fully competitive case the market clearing prices are set by generator target utilization rate policies, system reserve margin and mandatory load requirements. Based on sensitivity analysis of these factors we assess generators revenue gaps in the energy market, followed by revenue adjustment estimates through capacity payments and regulated tariff increases for mandatory electricity contracts and heat output. We reexamine neutrality of the starting conditions under proposed corporate structure in the Russian electricity generation sector in light of differences in simulated market performance of individual plants and various plant portfolios.

Energy Demand in Pakistan

Abdul QAYYUM, Muhammad Arshad KHAN

The role of energy has been universally recognized as an important ingredient in the process of economic and social development. Energy makes a significant contribution in the production of goods and services. The developing countries currently consume a limited share of the world's commercial energy. However, their economies suggest that they may soon come to consume the majority of world's energy. Hence, extensive investment is required in generation of new capacity to meet the growing demand of energy in developing countries. Pakistan is facing a big challenge of fueling industry and agriculture sector adequately for meeting the growth targets and providing energy at affordable cost to the poor especially those living in the rural areas. The current energy demand-supply gap results in a power shortage. This shortage will affect economic activities of the country adversely. The energy demand function will be estimated by using ARDL technique.

Resource Conservation and Directed R&D as Strategic Complements

Francesco RICCI

I present a simple model of a decentralized economy with endogenous supply of a non-renewable resource and endogenous R&D targeted to the non-renewable resource. I establish the necessary conditions for the emergence of multiple dynamic equilibrium paths, i.e. one with no R&D, no technological improvement and fast depletion, the other with R&D investment, technological progress and resource conservation. The latter equilibrium implies the largest possible expansion of the production possibilities set, because targeted R&D and resource conservation are complements. In fact if both take place, the technological improvement is applied to a larger resource base than otherwise. Coordination among decentralized agents is based on expectations and can therefore fail to exploit this complementarity. The necessary conditions for this type of failure to emerge are identified using a game theoretic model.

Partial Utility of the Biofuels Use in the Public Transport

Luca RIGAMONTI, Pirani ALBERTO, Anna GAVIGLIO, Rigamonti LUCA, Martina LICITRA PEDOL

Simultaneously to the formation of the megalopolis, increasing mobility flows are underlined. To analyze the citizens' attitudes within the public transport sector, the traditional investigation methods have some substantial limits: first, the behavior to purchase is conditioned by the presence of a monopolistic market; secondarily, the people are not inclined to express their true attitudes. In fact, they don't appraise every characteristic of the product, or service, in a separate way but through the association of the utility attributed to every characteristic (global utility). The observation of the consumers' behaviors will be effected, in the City of Milan case study, through the conjoint analysis. This allows one to individualize the attributes that are remarkable in the purchase process (partial utility) and their relative weight. This analysis will make possible to define guide lines to direct the possible future choices, in the themes of transport and sustainable development.

Crude Oil Futures Price Volatility: the Effect of Maturity, Trading Volume, and Open Interest on Range-Based Volatility

Ronald RIPPLE, Imad A. MOOSA

We analyze the relationship between the volatility of futures contract returns and the maturity of contracts, the daily trading volume, and the open interest. We introduce the open interest observations to the analysis to determine whether or not this additional measure of market activity increases our ability to explain volatility. We find that, whether we examine the relationship on a contract-by-contract basis of via time series analysis over an eleven year period, open interest does contribute significantly to the explanation of futures volatility for the New York Mercantile Exchange (NYMEX) crude oil contract.

This approach is motivated by the fact that open interest and its change differ significantly from trading volume, so we expect it to provide additional explanatory power. Open interest is defined as the number of contracts existing in a futures market that have not yet been closed out. It is reported as the number of outstanding contracts at the end of a trading day. Open interest increases from zero when a contract is first listed for trading, and it falls back to zero at the maturity of the contract when trading ceases. It typically reaches a maximum with about a month remaining to maturity. We expect open interest to provide additional information because the relationship between open interest and trading volume is quite complex, and, therefore, trading volume alone cannot be expected to effectively reveal this additional information.

Futures markets differ from equities markets in many respects. One specific element of difference has to do with open interest. There is not a directly comparable measure in equities. For equities there are a number of outstanding shares that may be traded, and trading volume in these markets captures the number of these given shares that are traded among market participants. Of specific note is the fact that trading volume cannot change the number of outstanding shares. The number of shares outstanding is determined as a policy decision by the corporate board, and increases or decreases occur infrequently.

In futures markets, however, there is no set number of outstanding contracts to be traded. Contracts come into existence simply by two parties being interested in buying and selling a contract. There is no direct, monotonic link between trading volume and open interest. Open interest and trading volume are effectively stock and flow measures, respectively. However, it will be the exception, rather than the rule, to find that the change in open interest between two trading days equals the trading volume that occurred during the day. For any given trading volume, the open interest for a contract may rise, fall, or remain unchanged.

Water Charges for Forest Protection in Brazil

Ronaldo SEROA DA MOTTA

New legislation in Brazil requires water users to pay Conservation Units for preservation services of watersheds that cross their site area. This paper firstly discusses pricing criteria for water charges. Secondly it develops a simple public pricing (Ramsey rule) model where it can be adjusted to include distributive aspects (such as, subsidy to low-income uses). An exercise is undertaken for the case of Três Picos Conservation Unit in Rio de Janeiro, Brazil, where users have been identified with their water consumption levels. Results show how much total charge revenue is achieved and how charge level varies among users when one moves from strict efficient to equity charge approaches.

Forecast of Energy Consumption in Housing Sector of Russia

Sergey SIVAEV, A. YU.RODIONOV

The report is based on the results of research in "Long-term forecasting of the effect of Russian electricity production sector reform on energy consumption amount in Russian housing sector", namely on the results of forecast for energy consumption in Russian housing sector up to the year of 2020, done by the Institute for Urban Economics at the order of State University "Higher School of Economics.

Describing the Phelix Forward Electric-Power Market. A Stochastic Volatility Model Approach
Per Bjarte SOLIBAKKE

The paper calibrates stochastic differential equation (SDE) models for the mean and volatility of the relative immature Phelix forward electric power market. The main objective is to find appropriate descriptions of commodity markets emphasising schemes for derivative pricing purposes. Our estimation reveals that a two-factor stochastic specification is successful for moments matching. As for path dependent derivatives, simulation can be considered an appropriate numerical methodology for pricing purposes. Re-projections are used to evaluate model characteristics and extract the latent volatility process. Simulation based derivative pricing schemes are implemented.

Oil Boom, Chewing-Gum, and Oil Fund
Engin SORHUN

When Kazakhstan was trying to go out from economic, social and political transition, suddenly faced well-known problems of the oil-rich countries. It is absolutely vital that Kazakhstan evaluate its oil-income for going out from transition and developing itself in accordance with the conditions of market economy. After the suggestion of the IMF, Kazakh Government constituted an oil fund in order to prevent its economy from volatility of oil-revenue and price-chocks in the oil market. This paper aims to reveal the impacts of the Kazakh Oil Fund on monetary budgetary and macroeconomic stabilities of the country through time-series regression analysis. In doing so, I test also to what extent an oil fund works in a transition country.

Strategic Investment in International Gas-Transport Systems: A Dynamic Analysis of the Hold-up Problem
Irina SULEYMANOVA, Franz HUBERT

We develop a dynamic model of strategic investment in the Eurasian transport system for natural gas. In the absence of international contract enforcement, countries may distort investment in order to increase their bargaining power, resulting in underinvestment in cheap and/or overinvestment in expensive pipelines. With repeated interaction, however, there is ponential to increase efficiency through dynamic collusion. In the theoretical part we establish a fundamental assymetry: it is easier to avoid overinvestment than underinvestment. Calibrating the model to fit the Eurasian pipeline system, we find that the potential to improve efficiency through dynamic cooperation is large. In reality, however, only modest improvements over the non-cooperative solution have been achieved.

Future European Electricity Technologies under Emission Trading: The Potential Role of Fossil Fuels and Carbon Capture and Sequestration (CCS)
Thure TRABER, Thure TRABER, Claudia KEMFERT

The European Commission has targeted ambitious reductions of CO2–emissions in the electricity sector for the coming decades. Consequently, a major shift towards low carbon electricity technologies is necessary. At the same time the use of existing climate friendly technologies like nuclear and renewable energy are limited by technical and political constraints. Therefore, the technological option of fossil fuel fired power plants with CCS are brought into the discussion. In this paper we develop the existing game theoretic model of the European electricity market EMELIE in order to assess investment in fossil fuel based power plants with the option of CCS under emission trading. Using common projections of the natural gas and hard coal prices we find that the CCS technology becomes competitive under carbon prices between 30 and 40 Euro per ton of CO2. However, these carbon prices induce an exhaustion of estimated European CO2-storage capacities already by 2050.

Nuclear Energy, CDM, and Climate Policy

Truong TRUONG, Hiroshi HAMASAKI, Claudia KEMFERT

We use the NEA/IEA data to modify the electricity production structure in the GTAP-E model to include the nuclear option for several countries. We then use the model to conduct policy simulations to analyse the effect of CDM with and without nuclear energy on climate policy. Under the existing Kyoto Agreement, nuclear energy is not included within CDM, but this may change Post-Kyoto. We carry the experiments to analyse the potential contribution of nuclear power to CDM. First, we assume the nuclear shares of electricity generation in China and India are increased from the existing level to about 10% and then attribute the reduction in emissions to CDM. The credits are then given to Japan (with respect to China) and Russia (with respect to India). From these credits, Japan and Russia can cut their own targets of emissions reductions and this will result in a reduced marginal abatement cost (MAC) in the range of 35% to 45%.

The Export of Russian Gas to Europe: Breaking Up the Monopoly of Gazprom

Marina TSYGANKOVA

Having exports from more than one Russian gas producer has been an important issue in the Russian–EU energy dialog during the last decade. Nevertheless, in June 2006, Russian Federal law legalized the de facto export monopoly of Gazprom. Political and commercial interests have regularly explained the Russian strategy for the European gas market. However, it is important that economic efficiency is also taken into account.In this paper, I examine both theoretically and numerically whether a liberalization of Russian gas exports would increase Russian national welfare, given that the Russian domestic market is already deregulated. The results of the paper show that the dominant position of Gazprom in the Russian gas industry might stimulate the government to support Gazprom´s export monopoly. The market share of independent producers in the Russian gas market would have to be significantly increased for Russian export liberalization to be welfare enhancing.

Dynamic Game of Transboundary Pollution Regulation and Strategic Abatement

Victoria UMANSKAYA, Charles MASON, Edward BARBIER

We develop an asymmetric dynamic model of transboundary pollution and trade and compare outcomes of two second-best scenarios: 1) The country adversely affected by pollution, Downstream, uses a tariff policy to control for the externality, while the polluting country, Upstream, is myopic; 2) Upstream engages in strategic abatement activity to influence the level of tariff. We show that the presence of the asymmetric externality is likely to encourage strategic behavior by both players: Downstream will find it optimal to unilaterally impose a sequence of tariffs determined by the current state of pollution. And if such tariffs are imposed, Upstream will unambiguously benefit from engaging in strategic abatement activity that reduces the pollution accumulation rate and gives rise to a lower level of the tariff in the long-run. Thus feedback strategies may suggest a mechanism that supports a self-enforcing trade and environmental agreement.

The effects of energy price shocks on growth and macroeconomic stability in selected energy-importing CIS countries

Lucio VINHAS DE SOUZA, Tatiana LYSENKO

After several years of low and stable prices for its gas exports to CIS countries, Russia has decided to review these arrangements and to significantly increase prices, bringing them closer to the levels applied to the EU. The steep increase in energy prices has significant economic implications for the importing countries. So far, the economic analysis has tended to adopt a country-specific focus. We adopt a cross-country perspective instead, comparing the macroeconomic effects of the energy-price shock on growth, macroeconomic stability, budget and balance of payments. The analysis shows that the expected negative effects associated with the gas price shock have not led to a GDP loss in any of the countries studied, mainly due to a combination of counterbalancing factors. However, some of these developments may raise concerns for the future. In particular the steep increase in private and quasi-private external debt observed over 2006 in most countries increases their vulnerability to future exogenous shocks, including further raises in energy prices.

Hedonic Valuation of Health Risks Due to Residential Radon

Jakob WINSTRAND

Radon is a radioactive gas which may exist in buildings and originates mainly from radioactive bedrock and radioactive building materials. Living in a radon contaminated house may increase the risk of suffering from lung cancer, especially among cigarette smokers. The potential risk arises due to long-term exposure to radon and the risk related to radon is thus limited to individuals living in contaminated buildings. Therefore, buyers of radon contaminated houses are likely to be willing to pay less than for non-contaminated houses, and house prices can be used to estimate the willingness-to-pay for reducing the risk due to radon. The purpose of this paper is to estimate the willingness-to-pay for reducing the risk due to radon contamination in the municipality of Stockholm, using a spatial hedonic house price model.

Analysis of Alternative Model Specifications in a CGE model for Carbon Tax Policy Analysis in Ireland

Wiepke WISSEMA, Rob DELLINK

This paper analyses five alternative specifications of the computable general equilibrium model developed by Wissema and Dellink (2006), which simulates implementation of carbon taxation in Ireland comparing different revenue recycling methods using endogenous taxes and transfers. These alternative specifications involve endogenous labour supply, the LES, the production structure concerning labour, capital and energy, an assumption that trading partners implement similar policies and the place of peat in the production function for electricity generation. Thus the importance of modelling these features differently in a CGE model can be assessed and the robustness of the model can be evaluated.

R&D Investments and Knowledge Input in a Technology Oriented CGE Model

Marcel ZÜRN, Robert KÜSTER, Ingo ELLERSDORFER, Ulrich FAHL

Innovations and technological progress are one of the main drivers for economic development. R&D investments induce a more efficient use of natural and environmental resources. We use the GCE model NEWAGE-W for the quantitative analysis of the implications of R&D induced technological change. We explicitly implement endogenous technological change by modeling R&D investments and knowledge as a primary factor input within the production process. Thus the basic input-output tables have been modified. In the enhanced CGE model knowledge endowment is determined by the endogenous calculated investments in R&D. To analyse the economic and ecological impacts of R&D investments and knowledge input two scenarios have been analysed. We calculate a scenario with direct subsidies on knowledge inputs and another scenario with subsidies on R&D investments. Knowledge accumulation has a stronger impact on economic development than changes in knowledge allocation.

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