Fisk, David

Working Paper
Transport Energy Security. The Unseen Risk?

Nota di Lavoro, Fondazione Eni Enrico Mattei, No. 118.2004

Provided in Cooperation with:
Fondazione Eni Enrico Mattei (FEEM)


This Version is available at:
http://hdl.handle.net/10419/117990

Terms of use:
Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.
Transport Energy Security
The Unseen Risk?
David Fisk
NOTA DI LAVORO 118.2004

SEPTEMBER 2004
IEM – International Energy Markets

David Fisk, Imperial College, London

This paper can be downloaded without charge at:
The Fondazione Eni Enrico Mattei Note di Lavoro Series Index:
http://www.feem.it/Feem/Pub/Publications/WPapers/default.htm
Social Science Research Network Electronic Paper Collection:
http://ssrn.com/abstract=XXXXXX

The opinions expressed in this paper do not necessarily reflect the position of
Fondazione Eni Enrico Mattei
Transport Energy Security. The Unseen Risk?

Summary

The decline in significance given to energy security in recent years can be associated with increasing trust in the self-balancing security of a global-trading economy. After the events of the first years of the 21st century, that framework now looks more problematic, at least for oil supplies. The underlying level of risk that characterised the oil market of the late 20th century has changed, exacerbated by the increasing inelasticity of demand for oil-based products in the transport sector of the world's economies, which in its turn reflects the strategic dominance of transport within economies.

The prudent course for the international community is to reduce the underlying causes of possible geopolitical constraints by making them more manageable through normal channels. One such constraint that is within every nation’s capability (and self-interest) to reduce is the upward drift in the price inelasticity of domestic oil consumption. This could involve increasing the ability to divert oil used within the domestic economy to transport. Yet for many industrial economies, this option has largely been exhausted and a more radical approach of opening up new energy vectors to supply the transport sector may be needed. Taking preventative action after a security event is generally more straightforward than taking precautionary action to ensure that it never happens. The latter course may only be successful through a coincidence with other interests. The current environment agenda is such a coincident interest with transport fuel security.

Keywords: Transport energy security, Risk

JEL Classification: Q41, Q43

This paper was prepared in connection with the INDES Project (Insuring against Disruption of Energy Supply), a one-year project financed by the European Commission – DG TREN (Contract Number NNE3/2002/91).

Address for correspondence:

David Fisk
BP/Royal Academy of Engineering
Imperial College London
London SW7 2BU
United Kingdom
E-mail: d.fisk@imperial.ac.uk
1 No end to history

As the liberal market model of the global economy gained ground towards the very end of the 20th century, energy security began to decrease as a component within OECD members’ energy policy. This was an entirely consistent development. In integrated, liberalised markets, fossil-fuel suppliers would rely as much on the basic products supplied to them by their customers, as their customers relied on fossil fuels. The liberalisation of energy markets required no further adjustment to earlier policies. As indigenous sources of energy, retained for national security (such as deep-mined coal or nuclear energy) were stripped of their subsidies and exposed to liberal market disciplines, they withered. Nevertheless, the first year of the 21st century demonstrated, with a jolt, that the shared values that are needed to underpin a global, liberalised market were not even remotely established. Further, this demonstration came from the very area of the world vital to energy supply, the Middle East.

2 Middle East transition and the price of oil

Under the scenario of liberalised markets, the present authoritarian regimes in the Middle East would gradually transform to liberal market democracies. On reflection, commentators may have been too sanguine about the prospects of realising this scenario. Unfortunately, at the beginning of the 21st century, 65% of the world’s oil-proven reserves are located in this region.\(^1\) While it is true that the underlying political uncertainty will increase risks, this does not necessarily imply an immediate risk to the security of supply. The system run under the International Energy Agency (IEA) has been tested several times and it has so far been able to help avert crises. Nevertheless, it may be wise in the long term to seek to reduce the price inelasticity of oil. Reducing price-inelasticity is not necessarily the same as reducing total demand, but it would be a reversal of the current underlying trend. The case for treating decreasing price-inelasticity as the immediate target of energy security is reinforced by two factors that have grown covertly in the 1990’s. These are the development of conditions for a chaotic market price and the growth of severe inelastic demand for transport fuels.

2.1 Supply-side price instability

The world’s exploitation of oil has never followed the classical economic model of exhausting the cheapest reserves first. Considerations of national security have led most countries to consume a mix of fuels within their market place, most of which have been subsidised to some degree relative to Middle East oil. The consequence is that the 1990’s continued to exhaust the global oil reserves in the $15 to $25 per barrel price range. The future energy market then draws from a tranche of resources with long-term marginal costs (which includes the front-end investment costs of bringing new investment on line) at $25 a barrel or more, and a core resource at around $10 billion in the Middle East, with little left in between. This ‘coring out’ of the cost of reserves in the $15 to $25 price band is the 20th
century’s legacy to the 21st century. Some of these high-cost options have short-term costs
(i.e. a low cost of extra production once on-stream) comparable with Middle East oil
production. If these were to be brought on line then Middle East producers risk being forced
back to their short-term costs. This cost structure sets the scene for a price that fluctuates
chaotically between ‘floors’ and ‘ceilings’. A price spike brings on expensive investment that,
during a drop in demand, offers a price that falls right back to low values. Figures for c/kWh
quoted for new nuclear capacity are typically twice those for operating costs of an existing
nuclear plant. For renewable energy sources, like wind or tidal power, the difference is even
larger. OPEC, while venturing to high prices in periods of high demand, is unwise to hold that
position too long unless the high-cost alternatives come on-stream. A market that is unstable
between a floor and ceiling price leads to only mild discomfort, unless the demand side is
price-inelastic. This is exactly what happened to refined oil products in the 1990’s. In such
circumstances it usually proves politically impossible to simply use market-clearing prices as
the management tool for sudden scarcity. The problem is particularly acute for transport,
where the price elasticity for gasoline is very low and the transport service is critical the
economy.

2.2 Sclerosis, not inelasticity

The oil crises of the 1970's are not good models for an oil crisis in the 21st century. The point
on which to focus is the use of transport fuel in the economy. The consumption of oil in
transport has risen faster than any other energy component of the developed economy. This
does not reflect a substitution for other kinds of access technology. The internal combustion
engine has created new and expanded journey patterns, gradually back-filled by extended
physical relocation and the separate centralisation of housing, workplace, leisure and services.
Travel surveys show consumers spend about as much time travelling now as they did 20 years
ago in almost every developed country. But since the car now dominates as the transport
mode, they are travelling around twice the distance, in more complex, individualised journey
patterns. This is perfectly consistent with a market model, where the search for optimality
drives down resilience.

The implication, however, is that oil for transport has become a much more ingrained basic
product of the economy. There has been no significant diversification in transport fuel mix
beyond refinement of the oil feedstock. So the 1970's model of creating price elasticity in a
price-unstable market by forms of rationing and allocation has become totally undermined.
Allocating priority access to fuel supplies in times of shortage to key workers, such as
doctors, fails if the plant operator cannot get to the hospital to manage the air conditioning.
There is no point to ‘working from home’ with IT if engineers cannot service the server
farms. Old presumptions, such as withdrawal of transportation for leisure use, fails when
leisure is not for picnics but access to centralised service industries that are such a key part of
the economic product.

The problem is that transport is totally price-inelastic in the (very) short term and totally
price-elastic in the (very) long term (through a readjustment of the relative location). A long
period of relatively low prices causes long-term relaxations in the economy that cannot be
quickly reversed. While energy source diversity characterises the electricity and low-grade
heating sectors of the economy, surface transport and aviation remain doggedly committed to

---

2 For example, in the UK there has been a 40% increase in the distance travelled per capita (all powered by
gasoline) since the last oil crisis.
only one fuel technology. An oil shortage would not now be an inconvenience. Because transport has become a basic commodity, it would be nearly catastrophic.

3 Increasing the price elasticity

There is more to energy policy than energy security. Perversely, a poor policy that encourages inefficient use of energy provides some fat in energy consumption in times of shortage. Very efficient use of energy is good for the economy, but may actually increase the need to pay greater attention to energy security issues because of a lack of slack. Designer inefficiency must be the most inefficient way to create energy security, but it also creates a sense of complacency. Low thermodynamic energy requirements like space heating are typically much easier to substitute than high-grade mechanical energy (including motive power) in times of shortage. 3 This contrasts with the transport sector where lowering speed limits (and thus increasing journey times) or rationing (withdrawing some journeys altogether) results in real economic impact. The best that can be done is to select the most efficient vehicle where choice from a fleet is available. Otherwise, in the short run, provision of access is stuck with patterns determined by previous land-use developments. A more proactive policy on transport price elasticity has three parallel tracks. The first is to have the capability of bringing increased supplies of non-Middle East oil on stream. The second is to be able to free oil from other uses by fuel substitution. The third and bolder track is to open up a new transport-fuel supply grid, using sources such as biofuels, hydrogen or electricity. Detailed options will vary with national circumstances. Few are cheap compared with $15 a barrel, though comparable or less to the military expenditure or economic disruption of not delivering the policy.

3.1 Options

Simply exhausting non-Middle East oil does nothing to improve the situation whilst the basic parameters of the security problem persist. But the capacity to bring extra oil on stream is an important element for softening the price elasticity of the product. Similarly, oil is used to raise steam in boilers or provide low-grade heating. Technologies are available off-the-shelf to enable dual firing with non-fossil oils, coal or gas. On the electricity grid, a non-oil fired plant can similarly displace oil by changing the merit order of the plant or making savings in low-grade demand such as building services. Finally, there is the option of introducing renewable energy where it could displace oil in current use. All these approaches effectively free available oil feedstock for refining and to transport quality refinery products. Biodiesel may be an especially important issue in developing countries where oil imports are first going directly to strategic uses such as water extraction and pumping. In regions with availability to gas, the oil substitution scenario is already exhausted.

3.2 Opening up a second grid

One of the reasons that the non-transport sectors are relatively resilient is that they are serviced by a portfolio of energy-sector supply grids. By contrast, transport has only one oil-based energy vector. Electric power to rail and trams is relatively small. Natural gas is an

---

3 For instance, a temperature change of 1°C in a thermostat, along with an appropriate choice of clothing can save around 10% of consumption in a building with no loss in performance. Within high-grade energy uses, provision of local task lighting can make twice this savings.
important option here, for countries with indigenous or secure gas supplies, as is liquefied natural gas. But in both cases the fiscal structure for motoring costs would seem to be needed to support the diversification. More ambitious is electrochemical technologies, either conventional batteries charged when oil is not on the supply grid or fuel cells supplied with hydrogen from a non-oil source. In both cases an intermediate energy vector is added alongside oil to gain access to the diversity of the national fuel mix. These may not be immediately accessible technologies but they are increasingly important as oil reserves concentrate in the Middle East through exhaustion elsewhere. Someday in the future, of course, technologies like these will be the successors to oil for transport. What they all have in common is that they provide a reduced environmental impact for transport.

4 A policy of looking for allies

The more adventurous the security programme is for reducing price inelasticity, the more it will need allies if it is not to have to wait until the first oil shortages to prove its rationale. Traditionally, the domestic industries that benefit from a policy of fuel diversity such as nuclear and deep-mined coal have proven to be powerful lobbyists for fuel security. They have been considerably weakened under liberalised energy markets. They have also suffered a

heavy handicap as a result of environmental protection policy. This handicap points to a problem if any proactive security policy were to lead to a reduction in environmental aspirations. Environmentalist energy policy had focussed largely on renewable energy sources, particularly with reference to reduced air emissions. In the transport sector, environmental interest had focussed more on efficiency than alternative fuels. An interesting exception has been initiatives such as the London Congestion Charge, where ‘green vehicles’ are exempt for a fee. Environmentalists, however, may not be a block. They could be the strongest ally.

4.1 Why environmentalists also have a problem

Environmental policy was the major determinant of much of the developed world’s energy policy in the early 1990’s. Its assaults on the traditional, subsidised energy industries did much to pave the way for the form of energy sector that survived the liberalisation of markets. After all, the subsidised industries received their subsidies both in cash and in weak environmental standards. The environmental energy policy at the beginning of the 21st century seems largely shaped by combating global warming. In one sense the issue becomes easier year by year. Since the effect is accumulative, its sceptics have an increasingly difficult task year on year to explain away rising global temperatures. But the policy faces a real difficulty as the balance between the mitigation and the abatement effort is struck. Unusually for an environment issue, abatement is not as effective as the mitigation of immediate harm. So environmentalists face a difficult and split constituency. They are already adding fuel security to the reasons for promoting greater use of renewable energy. But this is in an undeveloped form and in most cases is only weakly linked to the mainstream fuel-security agenda. The worst case scenario for environmentalists would be an energy emergency that reinstated coal and nuclear energy as the basic fuels of a developed economy. As the example

---

4 Around 75% of gas reserves are held about equally between the former Soviet Union and the Middle East, at a global-reserves-to-production ratio of 60 years.

of the London Congestion Charge exemptions show, green environmental policies can in fact be used to increase the diversity of the fuel mix in the transport sector.

5 Conclusion

There is a tough logic to energy security in the first few decades of the 21st century:

- Even if globalisation is to be the long-term security framework, there could be a very difficult transition period ahead in the next two decades.
- Recent events in the Middle East have highlighted premature expectations of globalisation.
- The Middle East will become the predominant supplier to the world oil market in the next few decades.
- There is currently little to stabilise the traded oil price between a floor price created by low, Middle East short-term costs and a ceiling created by the large, long-term costs of alternative energy supplies.
- The major oil importers have economies that have allowed transport fuel to gain an unparalleled strategic significance.
- Policies exist that would weaken the price-inelasticity of oil demand without appearing to jeopardise the economic stability of the Middle East.
- These policies predominantly relate to diversifying the transport fuel mix.
- The best hope of a precautionary application of these policies is an alliance with environmental interests, since diversified fuels tend to have lower environmental impacts.
- Environmentalists would have much to lose if they did not join the alliance and much to gain if they did.
- Private sector and regional governments are important players in the transport fuel diversification game.

The first steps are a serious scenario analysis of the implications of oil disruption that use data reflecting recent changes in the structure of the transport market. It would inevitably lead to power markets that have the flexibility to substitute-out oil, to refining capacity able to handle a rebalance of demand, to greater use of indigenous renewable resources and the development, over time, of parallel supply grids to oil for key elements of the transport sector.
### NOTE DI LAVORO PUBLISHED IN 2003

<table>
<thead>
<tr>
<th>Note Number</th>
<th>Title</th>
<th>Authors/Editors</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIV 2.2003</td>
<td>Ibolda SCHINDELE: Theory of Privatization in Eastern Europe: Literature Review</td>
<td></td>
</tr>
<tr>
<td>PRIV 3.2003</td>
<td>Wietze LISE, Claudia KEMFERT and Richard S.J. TOL: Strategic Action in the Liberalised German Electricity Market</td>
<td></td>
</tr>
<tr>
<td>KNOW 5.2003</td>
<td>Reyer GERLAGH: Induced Technological Change under Technological Competition</td>
<td></td>
</tr>
<tr>
<td>ETA 6.2003</td>
<td>Efrem CASTELNUOVO: Squeezing the Interest Rate Smoothing Weight with a Hybrid Expectations Model</td>
<td></td>
</tr>
<tr>
<td>SIEV 7.2003</td>
<td>Anna ALBERINI, Alberto LONGO, Stefania TONIN, Francesco TROMBETTA and Margherita TURVANI: The Role of Liability, Regulation and Economic Incentives in Brownfield Remediation and Redevelopment: Evidence from Surveys of Developers</td>
<td></td>
</tr>
<tr>
<td>NRM 8.2003</td>
<td>Elissaios PAPYRakis and Reyer Geralgh: Natural Resources: A Blessing or a Curse?</td>
<td></td>
</tr>
<tr>
<td>CLIM 9.2003</td>
<td>A. CAPARROS, J.-C. PEREAU and T. TAZDAIT: North-South Climate Change Negotiations: a Sequential Game with Asymmetric Information</td>
<td></td>
</tr>
<tr>
<td>KNOW 10.2003</td>
<td>Giorgio BRUNELLO and Daniele CHECCHI: School Quality and Family Background in Italy</td>
<td></td>
</tr>
<tr>
<td>CLIM 11.2003</td>
<td>Efrem CASTELNUOVO and Marzio Galeotti: Learning By Doing vs Learning By Researching in a Model of Climate Change Policy Analysis</td>
<td></td>
</tr>
<tr>
<td>KNOW 12.2003</td>
<td>Carole MAIGNAN, Gianmarco OTTAVIANO and Dino PINELLI (eds.): Economic Growth, Innovation, Cultural Diversity: What are we all talking about? A critical survey of the state-of-the-art</td>
<td></td>
</tr>
<tr>
<td>KNOW 14.2003</td>
<td>Maddy JANSSENS and Chris STEYAERT (lix): Theories of Diversity within Organisation Studies: Debates and Future Trajectories</td>
<td></td>
</tr>
<tr>
<td>KNOW 15.2003</td>
<td>Tuzin BAYCAN LEVENT, Enno MASUREL and Peter NIJKAMP (lix): Diversity in Entrepreneurship: Ethnic and Female Roles in Urban Economic Life</td>
<td></td>
</tr>
<tr>
<td>KNOW 16.2003</td>
<td>Alexandra BITUSIKOVA (lix): Post-Communist City on its Way from Grey to Colourful: The Case Study from Slovakia</td>
<td></td>
</tr>
<tr>
<td>KNOW 17.2003</td>
<td>Billy E. VAUGHN and Katarina MLEKOV (lix): A Stage Model of Developing an Inclusive Community</td>
<td></td>
</tr>
<tr>
<td>KNOW 18.2003</td>
<td>Selma van LONDON and Arie de RUIJTER (lix): Managing Diversity in a Globalizing World</td>
<td></td>
</tr>
<tr>
<td>PRIV 20.2003</td>
<td>Giacomo CALZOLARI and Alessandro PAVAN (lix): Monopoly with Resale</td>
<td></td>
</tr>
<tr>
<td>PRIV 22.2003</td>
<td>Marco LiCalzi and Alessandro PAVAN (lix): Tilting the Supply Schedule to Enhance Competition in Uniform-Price Auctions</td>
<td></td>
</tr>
<tr>
<td>PRIV 23.2003</td>
<td>David ETTINGER (lix): Bidding among Friends and Enemies</td>
<td></td>
</tr>
<tr>
<td>PRIV 24.2003</td>
<td>Hanna VARTIAINEN (lix): Auction Design without Commitment</td>
<td></td>
</tr>
<tr>
<td>PRIV 26.2003</td>
<td>Christine A. PARLOUR and Uday RAJAN (lix): Rationing in IPOs</td>
<td></td>
</tr>
<tr>
<td>PRIV 27.2003</td>
<td>Kjell G. NYBOG and Ilya A. STREBELAV (lix): Multiple Unit Auctions and Short Squeezes</td>
<td></td>
</tr>
<tr>
<td>PRIV 28.2003</td>
<td>Anders LUNANDER and Jan-Eric NIELSSON (lix): Taking the Lab to the Field: Experimental Tests of Alternative Mechanisms to Procure Multiple Contracts</td>
<td></td>
</tr>
<tr>
<td>PRIV 30.2003</td>
<td>Emiel MAASLAND and Sander ONDERSTAL (lix): Auctions with Financial Externalities</td>
<td></td>
</tr>
<tr>
<td>ETA 31.2003</td>
<td>Michael FINUS and Bianca RUNDSHAGEN: A Non-cooperative Foundation of Core-Stability in Positive Externality NTU-Coalition Games</td>
<td></td>
</tr>
<tr>
<td>KNOW 32.2003</td>
<td>Michele MORETTO: Competition and Irreversible Investments under Uncertainty</td>
<td></td>
</tr>
<tr>
<td>PRIV 33.2003</td>
<td>Philippe QUIRION: Relative Quotas: Correct Answer to Uncertainty or Case of Regulatory Capture?</td>
<td></td>
</tr>
<tr>
<td>KNOW 34.2003</td>
<td>Giuseppe MEDA, Claudio PIGA and Donald SIEGEL: On the Relationship between R&amp;D and Productivity: A Treatment Effect Analysis</td>
<td></td>
</tr>
<tr>
<td>ETA 35.2003</td>
<td>Alessandra DEL BOCA, Marzio GALEOTTI and Paola ROTA: Non-convexities in the Adjustment of Different Capital Inputs: A Firm-level Investigation</td>
<td></td>
</tr>
</tbody>
</table>
GG 36.2003  Matthieu GLACHANT: Voluntary Agreements under Endogenous Legislative Threats
PRIV 37.2003  Nadjeess BOUBAKRI, Jean-Claude COSET and Omran GUEDHAMI: Postprivatization Corporate Governance: the Role of Ownership Structure and Investor Protection
CLIM 38.2003  Rolf GOLOMBEK and Michael HOEL: Climate Policy under Technology Spillovers
KNOW 39.2003  Slim BEN YOUSSEF: Transboundary Pollution, R&D Spillovers and International Trade
CTN 40.2003  Carlo CARRARO and Carmen MARCHIORI: Endogenous Strategic Issue Linkage in International Negotiations
KNOW 42.2003  Timo GOESCHL and Timothy SWANSON: On Biology and Technology: The Economics of Managing Biotechnologies
CLIM 44.2003  Katrin MILLOCK and Céline NAUGES: The French Tax on Air Pollution: Some Preliminary Results on its Effectiveness
PRIV 45.2003  Bernardo BORTOLOTTI and Paolo PINOTTI: The Political Economy of Privatization
ETA 47.2003  Jens HORBACH: Employment and Innovations in the Environmental Sector: Determinants and Econometrical Results for Germany
CLIM 48.2003  Lori SNYDER, Nolan MILLER and Robert STAVINS: The Effects of Environmental Regulation on Technology Diffusion: The Case of Chlorine Manufacturing
CTN 50.2003  László A. KÖCZY and Luc LAUWERS (lxii): The Minimal Dominant Set is a Non-Empty Core-Extension
CTN 51.2003  Matthew O. JACKSON (lxii): Allocation Rules for Network Games
CTN 52.2003  Ana MAULEON and Vincent VANNETELBOSCH (lxii): Farsightedness and Cautiousness in Coalition Formation
CTN 54.2003  Matthew HAAG and Roger LAGUNOFF (lxii): On the Size and Structure of Group Cooperation
CTN 55.2003  Taiji FURUSAWA and Hideo KONISHI (lxii): Free Trade Networks
CTN 56.2003  Halis Murat YILDIZ (lxii): National Versus International Mergers and Trade Liberalization
CTN 57.2003  Santiago RUBIO and Alistair ULPH (lxii): An Infinite-Horizon Model of Dynamic Membership of International Environmental Agreements
KNOW 58.2003  Carole MAIGNAN, Dino PINELLI and Gianmarco I.P. OTTAVIANO: ICT, Clusters and Regional Cohesion: A Summary of Theoretical and Empirical Research
KNOW 59.2003  Giorgio BELLETTINI and Gianmarco I.P. OTTAVIANO: Special Interests and Technological Change
ETA 60.2003  Ronnie SCHOB: The Double Dividend Hypothesis of Environmental Taxes: A Survey
CLIM 61.2003  Michael FINUS, Ekko van IERLAND and Robert DELLINK: Stability of Climate Coalitions in a Cartel Formation Game
SIEV 63.2003  Alberto PETRUCCI: Taxing Land Rent in an Open Economy
CLIM 64.2003  Joseph E. ALDY, Scott BARRETT and Robert N. STAVINS: Thirteen Plus One: A Comparison of Global Climate Policy Architectures
SIEV 65.2003  Edi DEFRANCESCO: The Beginning of Organic Fish Farming in Italy
SIEV 66.2003  Klaus CONRAD: Price Competition and Product Differentiation when Consumers Care for the Environment
SIEV 67.2003  Paolo A.L.D. NUNES, Luca ROSSETTO, Arianne DE BLAEIJ: The Beginning of Organic Fish Farming in Italy
CLIM 68.2003  ZhongXiang ZHANG: Open Trade with the U.S. Without Compromising Canada's Ability to Comply with its Kyoto Target
KNOW 69.2003  David FRANTZ (lxii): Lorenzo Market between Diversity and Mutation
KNOW 70.2003  Ercole SORI (lxii): Mapping Diversity in Social History
KNOW 71.2003  Liljana SIMIC (lxii): What is Specific about Art/Cultural Projects?
KNOW 72.2003  Natalya V. TARANOVA (lxii): The Role of the City in Fostering Intergroup Communication in a Multicultural Environment: Saint-Petersburg’s Case
KNOW 73.2003  Kristine CRANE (lxii): The City as an Arena for the Expression of Multiple Identities in the Age of Globalisation and Migration
KNOW 74.2003  Kazuma MATOBA (lxii): Glocal Dialogue- Transformation through Transcultural Communication
KNOW 75.2003  Catarina REIS OLIVEIRA (lxii): Immigrants’ Entrepreneurial Opportunities: The Case of the Chinese in Portugal
KNOW 76.2003  Sandra WALLMAN (lxii): The Diversity of Diversity - towards a typology of urban systems
KNOW 77.2003  Richard PEARCE (lxii): A Biologist’s View of Individual Cultural Identity for the Study of Cities
KNOW 78.2003  Vincent MERK (lxii): Communication Across Cultures: from Cultural Awareness to Reconciliation of the Dilemmas
KNOW 79.2003  Giorgio BELLETTINI, Carlotta BERTI CERONI and Gianmarco I.P. OTTAVIANO: Child Labor and Resistance to Change
ETA 80.2003  Michele MORETTO, Paolo M. PANTEGHINI and Carlo SCARPA: Investment Size and Firm’s Value under Profit Sharing Regulation
| 2.2004 | ETA | Masahisa FUJITA and Shlomo WEBER: Strategic Immigration Policies and Welfare in Heterogeneous Countries |
| 3.2004 | PRA | Adolfo DI CARLUCCIO, Giovanni FERRI, Cecilia FRALE and Ottavio RICCHI: Do Privatizations Boost Household Shareholding? Evidence from Italy |
| 4.2004 | ETA | Victor GINSBURGH and Shlomo WEBER: Languages Disenfranchisement in the European Union |
| 7.2004 | PRA | Sandro BRUSCO, Giuseppe LOPOMO and S. VISWANATHAN (lxv): Merger Mechanisms |
| 8.2004 | PRA | Wolfgang AUSSENEGG, Pegaret PICHLER and Alex STOMPER (lxv): IPO Pricing with Bookbuilding, and a When-Issued Market |
| 9.2004 | PRA | Pegaret PICHLER and Alex STOMPER (lxv): Primary Market Design: Direct Mechanisms and Markets |
| 10.2004 | PRA | Florian ENGLMAIER, Pablo GUILLEN, Loreto LLORENTE, Sander ONDERSTAL and Rupert SAUSGRUBER (lxv): The Chopstick Auction: A Study of the Exposure Problem in Multi-Unit Auctions |
| 11.2004 | PRA | Bjarte BRENDESTORP and Harry J. PAARSCH (lxvii): Nonparametric Identification and Estimation of Multi-Unit, Sequential, Oral, Ascending-Price Auctions With Asymmetric Bidders |
| 12.2004 | PRA | Ohad KADAN (lxv): Equilibrium in the Two-Player, k-Doubling Auction with Affiliated Private Values |
| 13.2004 | PRA | Maarten C.W. JANSEN (lxv): Auctions as Coordination Devices |
| 14.2004 | PRA | Gadi FIBICH, Arieh GAVIOUS and Aner SELA (lxv): All-Pay Auctions with Weakly Risk-Averse Buyers |
| 15.2004 | PRA | Orly SADE, Charles SCHNITZLEIN and Jaime F. ZENDER (lxv): Competition and Cooperation in Divisible Good Auctions: An Experimental Examination |
| 16.2004 | PRA | Maria STRYZOWSKA (lxv): Late and Multiple Bidding in Competing Second Price Internet Auctions |
| 17.2004 | CCMP | Silvia Ben YOUSSEF: R&D in Cleaner Technology and International Trade |
| 18.2004 | NRM | Angelo ANTOCI, Simone BORGHESI and Paolo RUSSU (lxvii): Biodiversity and Economic Growth: Stabilization Versus Preservation of the Ecological Dynamics |
| 19.2004 | SIEV | Anna ALBERINI, Paolo ROSATO, Alberto LONGO and Valentina ZANATTA: Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice |
| 21.2004 | NRM | Jacqueline M. HAMILTON (lxv): Climate and the Destination Choice of German Tourists |
| 23.2004 | NRM | Pius ODUNGA and Henk FOLMER (lxv): Profiling Tourists for Balanced Utilization of Tourism-Based Resources in Kenya |
| 26.2004 | NRM | Juan Luis EUGENIO-MARTÍN, Noelia MARTÍN MORALES and Ricardo SCARPA (lxvii): Tourism and Economic Growth in Latin American Countries: A Panel Data Approach |
| 27.2004 | NRM | Raúl Hernández MARTÍN (lxvii): Impact of Tourism Consumption on GDP. The Role of Imports |
| 29.2004 | NRM | Marian WEBER (lxv): Assessing the Effectiveness of Tradable Landuse Rights for Biodiversity Conservation: an Application to Canada’s Boreal Mixedwood Forest |
| 30.2004 | NRM | Trond BJØRNDAL, Phoebe KOUNDOURI and Sean PASCOE (lxv): Output Substitution in Multi-Species Trawl Fisheries: Implications for Quota Setting |
| 36.2004 | KTHC | Franca ECKER COEN and Claudio ROSSI (lxvii): Foreigners, Immigrants, Host Cities: The Policies of Multi-Ethnicity in Rome, Reading Governance in a Local Context |
| 39.2004 | ETA | Alberto CAVALIERE: Price Competition with Information Disparities in a Vertically Differentiated Duopoly |
| 40.2004 | PRA | Andrea BIGANO and Stef PROOST: The Opening of the European Electricity Market and Environmental Policy: Does the Degree of Competition Matter? |
| 41.2004 | CCMP | Micheal FINUS (lxix): International Cooperation to Resolve International Pollution Problems |

CTN 43:2004 Sergio CurrARINI and Marco MARINI: Coalition Formation in Games without Synergies

CTN 44:2004 Marc ESCRIVUELA-VILLAR: Cartel Sustainability and Cartel Stability

NRM 45:2004 Sebastian Bervoets and Nicolas GrAvE (lxvi): Appraising Diversity with an Ordinal Notion of Similarity: An Axiomatic Approach

NRM 46:2004 Signe ANTHON and Bo JELLESMARK THORSSEN (lxvi): Optimal Afforestation Contracts with Asymmetric Information on Private Environmental Benefits


NRM 48:2004 Ekin BIROL, Agnes GYOAI and Melinda SMALE (lxvi): Using a Choice Experiment to Value Agricultural Biodiversity on Hungarian Small Farms: Agri-Environmental Policies in a Transition al Economy

CCMP 49:2004 Gernot KLEPPER and Sonja PETERSON: The EU Emissions Trading Scheme, Allowance Prices, Trade Flows, Competitiveness Effects

GG 50:2004 Scott BARRETT and Michael HOEL: Optimal Disease Eradication

CTN 51:2004 Dinko DIMITROV, Peter BORM, Raud HENDRICKX and Shao CHIN SUNG: Simple Priorities and Core Stability in Hedonic Games

SIEV 52:2004 Francesco RICCI: Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory


NRM 54:2004 Ingo BRÄUER and Rainer MARGGRAF (lxvi): Valuation of Ecosystem Services Provided by Biodiversity Conservation: An Integrated Hydrological and Economic Model to Value the Enhanced Nitrogen Retention in Renatured Streams


NRM 56:2004 Tom DEDEURWAERDERE (lxvi): Bioprospection: From the Economics of Contracts to Reflexive Governance

CCMP 57:2004 Katrin REHDIANZ and David MADDISON: The Ametry Value of Climate to German Households


NRM 59:2004 Valentina BOSETTI, Mariaënzer CASSINELLI and Alessandro LANZA (lxvi): Using Data Envelopment Analysis to Evaluate Environmentally Conscious Tourism Management

NRM 60:2004 Timo GOESCHL and Danilo CAMARGO IGLOIRI (lxvi): Property Rights Conservation and Development: An Analysis of Extractive Reserves in the Brazilian Amazon

CCMP 61:2004 Barbara BUCHNER and Carlo CARRARO: Economic and Environmental Effectiveness of a Technology-based Climate Protocol


NRM 63:2004 Györgyi BELA, György PATAKI, Melinda SMALE and Mariann HAJDÚ (lxvi): Conserving Crop Genetic Resources on Smallholder Farms in Hungary: Institutional Analysis

NRM 64:2004 E.C.M. RULIGROK and E.E.M. NILLESEN (lxvi): The Socio-Economic Value of Natural Riverbanks in the Netherlands


ETA 66:2004 Giannis VARDAS and Anastasios XEPAPAIDES: Uncertainty Aversion, Robust Control and Asset Holdings

GG 67:2004 Anastasios XEPAPAIDES and Constandina PASSA: Participation in and Compliance with Public Voluntary Environmental Programs: An Evolutionary Approach


CTN 70:2004 Alejandro CAPARRÓS, Abdelhamid HAMMOUDI and Tarik TAZDAI: On Coalition Formation with Heterogeneous Agents

IEM 71:2004 Massimo GIOVANNINI, Margherita GRASSO, Alessandro LANZA and Matteo MANERA: Conditional Correlations in the Returns on Oil Companies Stock Prices and Their Determinants

IEM 72:2004 Alessandro LANZA, Matteo MANERA and Michael MCALEER: Modelling Dynamic Conditional Correlations in WTI Oil Forward and Futures Returns


CCMP 74:2004 Rob DEllINK and Ekkko van IERLAND: Pollution Abatement in the Netherlands: A Dynamic Applied General Equilibrium Assessment

ETA 75:2004 Rosella LEVAGGI and Michele MORETTO: Investment in Hospital Care Technology under Different Purchasing Rules: A Real Option Approach


CTN 78:2004 Francis BLOCH and Armando GOMES (lxv): Contracting with Externalities and Outside Options
IEM 118
Christian EGENHOFER, Kyriakos GIALOGLOU, Giacomo LUCIANI, Maroeska BOOTS, Martin
IEM 117.2004
Pierre-André JOUVET, Philippe MICHEL and Gilles ROTILLON: Equilibrium with a Market of Permits
CTN 80.2004
Rolf GOLOMBEK and Michael HOEL: Climate Agreements and Technology Policy
GG 90.2004
79.2004 Rabab AMIR, Effrosyni DIAMANTOUDI and Licun XUE (lxx): Merger Performance under Uncertain Efficiency Gains
CTN 82.2004
Edward CARTWRIGHT (lxx): Learning to Play Approximate Nash Equilibria in Games with Many Players
CTN 81.2004
Sanjeev GOYAL, Marco van der LEIJ and José Luis MORAGA-GONZÁLEZ (lxx): Economics: An Emerging Small World?
IEM 85.2004
Valeria COSTANTINI and Valeria PAPPONETTI and Dino PINELLI
CTN 80.2004
Siddhartha BANDYOPADHYAY and Mandar OAK
GG 90.2004
Rod GARRATT, James E. PARCO, Cheng-ZHONG QIN and Annon RAPOPORT (lxx): Potential Maximization and Coalition Government Formation
CCMP 95.2004
Bob van der ZWAAN and Reyer GERLAGH
GG 90.2004
Hans-Peter WEIKARD, Michael FINUS and Juan-Carlos ALTAMIRANO-CABRERA: The Impact of Surplus Sharing on the Stability of International Climate Agreements
SIEV 100.2004
Chiara M. TRAVISI and Peter NIJKAMP: Willingness to Pay for Agricultural Environmental Safety: Evidence from a Survey of Milan, Italy, Residents
SIEV 101.2004
Chiara M. TRAVISI, Raymond J. G. M. FLORAX and Peter NIJKAMP: A Meta-Analysis of the Willingness to Pay for Reductions in Pesticide Risk Exposure
SIEV 102.2004
Valentina BOSETTI and David TOMBERLIN: Real Options Analysis of Fishing Fleet Dynamics: A Test
CCMP 103.2004
Alessandra GORIA e Gretel GAMBARELLI: Economic Evaluation of Climate Change Impacts and Adaptability in Italy
PRA 104.2004
Massimo FLORIO and Mara GRASSENI: The Missing Shock: The Macroeconomic Impact of British Privatisation
PRA 105.2004
John BENNETT, Saul ESTRIN, James MAW and Giovanni URGA: Privatisation Methods and Economic Growth in Transition Economies
PRA 106.2004
Kira BÖRNER: The Political Economy of Privatization: Why Do Governments Want Reforms?
PRA 107.2004
Pehr-Johan NORBÄCK and Lars PERSSON: Privatization and Restructuring in Concentrated Markets
SIEV 108.2004
Angela GRANZOTTO, Fabio PRANOVI, Simone LIBRALATO, Patrizia TORRICELLI and Danilo MAINARDI: Comparison between Artisanal Fishery and Manila Clam Harvesting in the Venice Lagoon by Using Ecosystem Indicators: An Ecological Economics Perspective
CTN 109.2004
Somdeb LAHIRI: The Cooperative Theory of Two Sided Matching Problems: A Re-examination of Some Results
NRM 110.2004
Giuseppe DI VITA: Natural Resources Dynamics: Another Look
SIEV 111.2004
Anna ALBERINI, Alistair HUNT and Anil MARKANDYA: Willingness to Pay to Reduce Mortality Risks: Evidence from a Three-Country Contingent Valuation Study
KTHC 112.2004
Valeria PAPPONETTI and Dino PINELLI: Scientific Advice to Public Policy-Making
SIEV 113.2004
Paulo A.L.D. NUNES and Laura ONOFRI: The Profile of a “Warm-Glower”: A Note on Consumer’s Behavior and Public Policy Implications
IEM 114.2004
Patrick CAYRADE: Investments in Gas Pipelines and Liquefied Natural Gas Infrastructure What is the Impact on the Security of Supply?
IEM 115.2004
Valeria COSTANTINI and Francesco GRACCEVA: Oil Security. Short- and Long-Term Policies
IEM 116.2004
Valeria COSTANTINI and Francesco GRACCEVA: Social Costs of Energy Disturbances
IEM 117.2004
Christian EGENHOFER, Kyriakos GIALOGLOU, Giacomo LUCIANI, Maroeska BOOTS, Martin SCHLEEPERS, Valeria COSTANTINI, Francesco GRACCEVA, Anil MARKANDYA and Giorgio VICINI: Market-Based Options for Security of Energy Supply
IEM 118.2004
David FISK: Transport Energy Security. The Unseen Risk?
### 2003 SERIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLIM</td>
<td>Climate Change Modelling and Policy</td>
<td>Marzio Galeotti</td>
</tr>
<tr>
<td>GG</td>
<td>Global Governance</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>SIEV</td>
<td>Sustainability Indicators and Environmental Valuation</td>
<td>Anna Alberini</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resources Management</td>
<td>Carlo Giupponi</td>
</tr>
<tr>
<td>KNOW</td>
<td>Knowledge, Technology, Human Capital</td>
<td>Gianmarco Ottaviano</td>
</tr>
<tr>
<td>IEM</td>
<td>International Energy Markets</td>
<td>Anil Markandya</td>
</tr>
<tr>
<td>CSRM</td>
<td>Corporate Social Responsibility and Management</td>
<td>Sabina Ratti</td>
</tr>
<tr>
<td>PRIV</td>
<td>Privatisation, Regulation, Antitrust</td>
<td>Bernardo Bortolotti</td>
</tr>
<tr>
<td>ETA</td>
<td>Economic Theory and Applications</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>CTN</td>
<td>Coalition Theory Network</td>
<td>Carlo Carraro</td>
</tr>
</tbody>
</table>

### 2004 SERIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCMP</td>
<td>Climate Change Modelling and Policy</td>
<td>Marzio Galeotti</td>
</tr>
<tr>
<td>GG</td>
<td>Global Governance</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>SIEV</td>
<td>Sustainability Indicators and Environmental Valuation</td>
<td>Anna Alberini</td>
</tr>
<tr>
<td>NRM</td>
<td>Natural Resources Management</td>
<td>Carlo Giupponi</td>
</tr>
<tr>
<td>KTHC</td>
<td>Knowledge, Technology, Human Capital</td>
<td>Gianmarco Ottaviano</td>
</tr>
<tr>
<td>IEM</td>
<td>International Energy Markets</td>
<td>Anil Markandya</td>
</tr>
<tr>
<td>CSRM</td>
<td>Corporate Social Responsibility and Management</td>
<td>Sabina Ratti</td>
</tr>
<tr>
<td>PRA</td>
<td>Privatisation, Regulation, Antitrust</td>
<td>Bernardo Bortolotti</td>
</tr>
<tr>
<td>ETA</td>
<td>Economic Theory and Applications</td>
<td>Carlo Carraro</td>
</tr>
<tr>
<td>CTN</td>
<td>Coalition Theory Network</td>
<td>Carlo Carraro</td>
</tr>
</tbody>
</table>