

Costantini, Valeria; Gracceva, Francesco

Working Paper

Social Costs of Energy Disruptions

Nota di Lavoro, No. 116.2004

Provided in Cooperation with:

Fondazione Eni Enrico Mattei (FEEM)

Suggested Citation: Costantini, Valeria; Gracceva, Francesco (2004) : Social Costs of Energy Disruptions, Nota di Lavoro, No. 116.2004, Fondazione Eni Enrico Mattei (FEEM), Milano

This Version is available at:

<https://hdl.handle.net/10419/117996>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

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.

Social Costs of Energy Disruptions

Valeria Costantini and Francesco Gracceva

NOTA DI LAVORO 116.2004

SEPTEMBER 2004

IEM – International Energy Markets

Valeria Costantini and Francesco Gracceva, *ENEA and Fondazione Eni Enrico Mattei*

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

Social Costs of Energy Disruptions

Summary

The costs of energy supply disruptions for industrialised economies go well beyond the economic measures of national accounts. According to different kinds of risks, physical shortages or price shocks, there are several categories of negative effects. Oil disruptions have both a direct and an indirect impact, (at global and local levels) and have a short- and a medium-term horizon. The economic effects of electricity shortages are also direct and indirect, but the temporal lag is shorter than for oil disruptions. In this paper, we summarise the different ways an economy is affected by an oil shock or a power black-out. Oil crises in the past produced high inflation rates, trade and payments imbalances, high unemployment, and weak business and consumer confidence. The social costs of electricity shortages have immediate negative results, and relatively small, indirect effects – depending on the extension of the disruption, the duration, the availability of advance warning and information. A specific assessment of the social costs of an electricity shortage remains a research task for the future.

Keywords: Social costs, Energy disruption

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 NNE5/2002/91).

Address for correspondence:

Valeria Costantini
ENEA, Centro della Casaccia
Via Anguillarese 301
Roma
Italy
Phone: +390630481
Fax: +39063048 4203
E-mail: valeria.costantini@casaccia.enea.it

1. Introduction

There is general agreement within international literature about the nature of the costs of supply disruptions, affirming that they go well beyond the economic measures of the national accounts. Energy use pervades daily life in such a constant and ubiquitous way that it is very difficult to distinguish among all the short- and long-term negative effects.

Energy security and supply disruption

To assess the social costs resulting from a supply disruption, it is first necessary to have a precise definition of what a supply disruption is. It seems useful to start from the definition of energy security: energy security is defined in terms of the *physical availability of supplies to satisfy demand at a given price*. So, the security problem involves a quantity risk and a price risk. And it has a long-term and a short-term component (a long-term trend of rising prices for energy imports has a different implication for an economy than a sudden price hike or price volatility). Thus, a supply disruption occurs when the physical availability of the resource falls under some defined threshold (for a 'sufficient' length of time) or its price overcomes some other threshold or both, with the obvious consequence that the definition of disruption becomes quite arbitrary, as it depends on the assumed thresholds. It is also important to understand that the social cost of a primary energy-supply crisis tends to be heavily influenced by the specific historical setting and the geopolitical situation in which it occurs (IEA, 2001a, p. 76).

Generally speaking, the social costs of supply disruptions can be classified under the category of economic externalities. The social costs of security are those costs that accrue to others in the economy, generating a need for governments to step in and take protective measures (IEA, 2001a). In order to differentiate among the main components of external social costs, it is necessary to clearly separate internal (or private) costs from external (social) costs.

The social costs of energy disruption can be allocated into different categories, based on the varying kinds of risks posed, such as a physical oil shortage, a prolonged interruption in electric power (quantity risk) or a sudden rise in oil prices (price risk). Usually oil disruptions (especially quantity shortages) have both direct and indirect effects, with a short and medium-term horizon. With regard to power-generating shortages, the economic effects for society are also direct and indirect, but the temporal lag is shorter than for oil disruptions.

Using these characteristics, it is possible to separately analyse the economic impact of oil crises and power-generation or distribution interruptions. In any case, a perfect distinction between internal and external costs (i.e. private and social costs) is a very difficult task.

2. Social costs of oil disruptions

With regard to oil disruptions, energy security is defined in terms of the physical availability of supplies to satisfy demand at a given price. Oil shocks can be split into several categories, notably price, quantity and technology (Helm, 2002):

- price shocks are the most common;
- quantity shocks relate to physical constraints; and

- technology shocks relate to new concepts and ideas, to failures (i.e. the discovery of nuclear design faults) or to new constraints (i.e. an unanticipated technical advantage of nuclear energy over oil with the discovery of the climate-change problem).

Thus, the security problem also has a long-term and short-term component: long-term rising prices for oil imports have a different implication for an economy than a sudden price hike or price volatility.

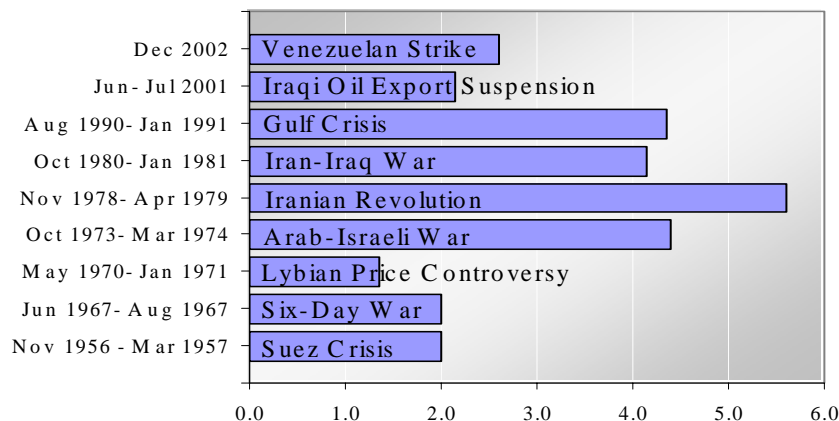
Looking at the past, after the main oil crises, OECD countries and the world were stricken by high inflation, trade and payments imbalances, high unemployment, and weak business and consumer confidence. Generally speaking, an increase in oil prices leads to a transfer of income from the importing to the exporting country through a shift in the terms of trade. For net oil-importing countries, an increase in oil prices directly reduces real national income because spending on oil rises and there is less national income available to spend on other goods. For net oil-exporting countries, a price increase directly increases real national income through higher export earnings. The boost to economic growth in oil-exporting countries provided by higher oil prices is generally less than the loss of economic growth in importing countries, such that the net effect on the global economy is negative.

Oil supply disruptions have occurred rather frequently: over the past half century, there have been at least 14 significant disruptions involving a loss of 0.5 mb/d or more of crude oil. Most of these disruptions were related to political or military upheavals, especially in the Middle East. Since 1973, four major crises – the 1973 Arab-Israeli war, the 1978-89 Iranian revolution, the 1980 Iran-Iraq war and the 1990-91 Gulf war – resulted in initial shortfalls of between 4.0 and 5.6 mb/d. Virtually all past oil disruptions have been short, typically lasting a maximum of nine months.

Based on the most relevant literature on the subject (IEA, 2001a; Toman, 2002), the politically-based disruptions can be grouped into two categories:

- random shocks, caused by internal unrest in OPEC countries, such as the Iranian revolution in 1978-79, the Nigerian civil war of 1967-70 or the Iran-Iraq war and the 1990 Iraq invasion of Kuwait; and
- strategic shocks involving the exercise of market power by Middle Eastern oil producers such as the Arab oil embargoes of 1957, 1967 and 1973-74.

Figure 1. Magnitude of supply shortfall (mb/d), 1957-2002



Source: Harks, 2003.

Establishing the point at which an oil shortage becomes a crisis is not an easy task. In an attempt to identify a reference value for oil price variation and reductions in oil consumption based on past shocks (Figure 1 and Table 1), it emerges that a possible minimum value for price and consumption variations could be respectively 100% and 4 million barrels per day.¹

Table 1. World oil supply disruptions

Dates	Supply disruption	Magnitude of supply shortfall (mb/d)	World oil consumption (mb/d)	Oil price change (%)
Mar. 1951–Oct. 1954	Iranian fields nationalised	0.7	13.2	12.87 ^a (cum)
Nov. 1956–Mar. 1957	Suez war	2.0	17.5	9.47 ^a
Dec. 1966 – Mar. 1967	Syrian transit fee dispute	0.7	34.3	n.a.
Jun. 1967 – Aug. 1967	Six Day War	2.0	40.0	n.a.
Jul. 1967 – Oct. 1968	Nigerian civil war	0.5	40.1	n.a.
May 1970 – Jan. 1971	Libyan price controversy	1.3	48.0	24.44 ^a
Apr. 1971 – Aug. 1971	Algerian-French nationalisation struggle	0.6	50.2	n.a.
Mar. 1973 – May 1973	Lebanese political conflict	0.5	58.2	32.66 ^a
Oct. 1973 – Mar. 1974	October Arab-Israeli war	4.3	58.2	252.98 ^a
May 1977	Damage of Saudi oilfield	0.7	62.1	n.a.
Nov. 1978 – Apr. 1979	Iranian revolution	5.6	65.1	120.8 ^a
Oct. 1980 – Jan. 1981	Outbreak of Iran-Iraq war	4.1	60.4	18.85 ^a
Mar. 1989 – Apr. 1989	Exxon Valdez accident	<0.5	51.6	16.95 ^b
Apr. 1989 – Jun. 1989	UK Cormorant Platform	0.5	51.6	n.a.
Aug. 1990 – Jan. 1991	Iraqi invasion of Kuwait	4.3	66.3	113.21 ^b
Jun – Jul 2001	Iraqi oil export suspension	2.2	75.4	n.a.
Dec. 2002	Venezuelan strike	2.7	75.7	18.07 ^b

Notes: ^a Oil price increase on annual basis.

^b Oil price increase on monthly basis.

Sources: Authors' elaborations on IEA (2001a), BP (2003) and EconStat (2003).

¹ An analysis based on the total value of oil shortfall ignores any evaluation about the relative magnitude of a crisis compared with total demand. As an example, during the Gulf war (1991) the percentage of reduction in oil supply compared to world demand was much higher, at 9%, than the reduction during the 1979 Iranian revolution at 7%. From the analysis of total value, however, opposite results emerge, with a greater magnitude of shortfall for the 1979 crisis.

2.1 Macroeconomic effects

Using these limit values to characterise relevant past crises, various studies have attempted to establish whether or not there are linkages between oil shocks (higher oil prices) and reduced economic growth rates. At first, it was widely believed that the 1974-75 recession and the emergence of ‘stagflation’ – a combination of inflation and rising unemployment – in industrialised countries was caused primarily by the oil price increase of 1973-74. But there is no general agreement on the magnitude of the negative impact of an oil shock on the whole economy.

In this regard, on one side there are studies such as those in Huntington (1998), where an asymmetric relationship has been demonstrated, in that a reduction in oil prices does not necessarily lead to noticeable output growth, while an increase can have a negative impact on output growth. Furthermore, disruptions in the oil market not only give rise to higher prices, but also increase oil-price volatility (Ferderer, 1996). Chaudhuri (2001) recently found that nonstationary commodity prices could be attributed to the nonstationarity of oil prices. In other words, as real oil prices and real commodity prices are co-integrated, oil shocks have a negative impact on economic performance.

Other studies, concentrated more on the role of fiscal and monetary policy, suggest that recessions in the oil-importing countries were less the direct result of higher prices and more the consequence of the economic policies adopted to alleviate the price shock (IEA, 2001b). In any case, looking at real data, oil-importing countries have experienced significant economic effects from oil shocks.

Highlighting some factors that are widely agreed upon, supply-side shocks appear in the economic system as autonomous variations of imported raw material costs, with *external* effects (at the international level) and *internal* effects (at the national level).

External, global effects

The main *external* effect of a shock is the income reallocation, between importing and exporting countries and also among importing countries. With regard to importing countries, an increase in the oil price directly reduces GDP, because the increased expenditure for imported oil reduces the income available for other goods and services. Within exporting countries, however, an increase of oil price (exported good) directly produces a growth of GDP, owing to the augmented revenues derived from exports. Nonetheless, positive GDP growth for exporting countries is generally considered to be lower than the reduction of growth in importing countries. Therefore, the total effect on the global economy is negative (Birol, 1998). Furthermore, income reallocation among importing countries is derived from the different capacity of each country to substitute imported energy with other energy carriers (or to substitute energy with other inputs).

Internal, local effects

The *internal* effects of a shock are linked to the typical economic policy variables (Pireddu, 1990), including:

- the activity level and the correlated employment rate;
- the inflation rate and the correlated income distribution between salaries and profits, which are determinants for capital accumulation and competitiveness at the national level; and
- the trade balance equilibrium and the correlated level of the exchange rate.

For countries that import oil, an increasing oil price in the global market can be seen to have three main (and direct) effects on their economies, which are:

- a *direct* effect on economic activity because more spending will be allocated to energy costs;
- a *financial* effect because of the rise of inflation and interest rates; and
- a *trade* effect relating to an increased oil import bill, which worsens the trade balance.

Apart from losses in GDP and balance of payments, other macroeconomic *indirect* effects, linked to the previous ones, may include the following:

- a fall in tax revenues pertaining to rigidities in government expenditure, which can produce an increase in the budget deficit and eventually drive interest rates up;
- because of the resistance to real declines in wages, an oil price increase typically leads to upward pressure on nominal-wage levels; together with reduced demand, wage pressures can in turn lead to higher unemployment; these effects are magnified by the swiftness of the price increase and inflexibility of the labour market (and could be further increased by the impact of higher oil prices on consumer and business confidence); and
- a decrease of exports because of the rise of the internal price, which reduces the competitiveness of national products.

Thus, increases in inflation and unemployment rates are the main, macroeconomic features of social costs, while other factors such as GDP loss and balance of payments are more difficult to allocate among their private and social components.

A comparison between two oil shocks

After the 1973 and 1979-80 oil price crises there were various negative effects in terms of GDP and balance of payments losses, each representing a substantial terms of trade deterioration for the OECD as a whole, equivalent to around 2% of GDP. Because of the rather low price-elasticity of oil in the short term, the increase in the net oil-import bill has been very large in both cases, even though total oil demand has declined because of lower GDP growth, as a result of oil-price increases.

Nevertheless, it should be noted that there are some differences between the 1973 and the 1979-80 oil price shock, because of the different magnitudes of price variation. In the first one, imported oil prices increased by 250%, while in the period from the end of 1978 to the end of 1980, imported oil prices increased by about 20% (see Table 1).

Even in the case of the inflation rate, although the two oil price shocks were similar, inflation was lower in the second oil shock. Inflation reacted more strongly in 1973 (when the spread of private-consumption deflator growth rates more than doubled between the second half of 1973 and the first half of 1974), than it did in the early 1980s because of the change of monetary policy in many countries.

2.2 Factors affecting the impact of a shock

The magnitude of the economic costs (private, social or both) of an oil price increase can be profoundly affected by several factors. The major factors highlighted by literature (Birol, 1998; IEA, 2001b; Mitchell, 2002; Pireddu, 1990) are the following:

- The main two determinants are obviously the level and the duration of the price increase and the quantity of crude oil available on the global market, both of which are directly linked to the characteristics of the market. It is particularly important to highlight that the

duration of the macroeconomic impact of an oil shocks is generally limited to two years after the price change. Thus, it is important to distinguish between a fast and high increase and a steady rise in the price of oil.

- The response of oil markets to an oil price hike, depending on the characteristics of the market, also contribute to determining the level of the economic costs.
- Other critical factors relate to the structural characteristics of the economy: first, the weight of energy costs on GDP, which is directly linked to the share of energy intensive sectors in the industry; second, the flexibility of the energy sector, i.e. its capacity to shift from one source to another; and third, the elasticity of internal prices to the price of imported oil, as in the short period the negative effects on economic activity could be reduced through a greater increase of internal prices (which in an open economy could otherwise have negative consequences in the longer term, by reducing the competitiveness of the country).
- Other country-specific factors can deeply influence the economic effects of an oil price increase: the macroeconomic trends acting before and during the oil shock; the economic policies applied before the crisis; specific institutional mechanisms, particularly for the industrial relationships and the labour market (wage and salary formation); the actual increase of energy prices in each country, in relation to the fuel mix, the specific fuel consumption and the level of petroleum-products taxation; and the response capacity of the energy system, in terms of industrial and institutional flexibility.
- Finally, the social costs of energy shocks are obviously affected by the specific historical and geopolitical context.

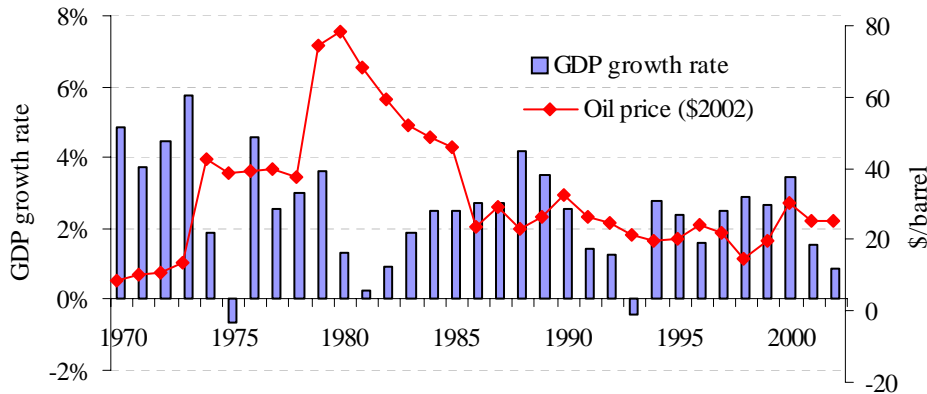
The above remarks show that, as stressed in many recent contributions, the impact of oil price shocks on the macroeconomy can be accentuated by the economic and energy-policy response to a combination of higher inflation, higher unemployment, lower exchange rates and lower real output. In particular, highly contractionary monetary and fiscal policies to contain inflationary pressures could exacerbate the effects on recessionary income and unemployment (Birol, 1998). Thus, as government policy can influence the overall impact on the economy over the longer term, even if it cannot eliminate such adverse impacts as those described above, it should operate to minimise them. To highlight just one critical factor in the effectiveness of the policy response, from experience it seems necessary to limit the spread of inflation across the whole economy. In the short term, the higher cost of imported energy could be faced either by trying to protect the activity level or by limiting the inflation rate. Economic theory shows that if the economic structure tends to be affected by a wage-price spiral, policy measures to reduce the cost of an oil shock could become less effective.

3. Some quantitative estimates

Although the general mechanism by which oil prices affect economic performance is generally well understood, the precise dynamics and magnitude of these effects – especially adjustments to changes in the terms of trade – are uncertain. Quantitative estimates of the overall macroeconomic damage caused by past oil-price shocks and the gains from the 1986 price collapse to the economies of oil-importing countries vary substantially. This is partly a result of differences in the models used to examine the issue. Nevertheless, the effects were certainly significant: economic growth fell sharply in most oil-importing countries in the two years following the price hikes of 1973-74 and 1979-80. The impact of the first oil shock was undoubtedly accentuated by inappropriate policy responses. Conversely, economic growth in importing countries was boosted by the fall in prices in 1986, with the full economic impact

becoming apparent in 1987-88. Looking at the GDP growth rate compared to the real oil price trend (net of GDP-deflator rate) in the European Union, a general correlation between higher oil prices and a lower GDP growth rate with a one or two-year lag is quite clear (Figure 2).

Figure 2. Oil price and GDP growth rate in European Union, 1970-2001



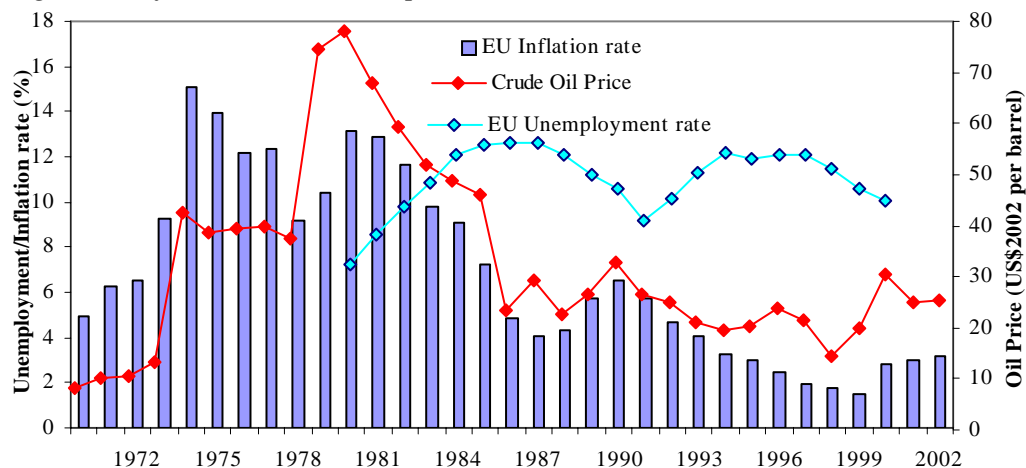
Sources: Authors' elaborations on data from the World Bank (GDP growth rate) and EconStat (oil price).

A general assessment of the magnitude of GDP loss could be built by analysing the GDP growth-rate variation after the three main oil crises. After any crisis a negative impact on GDP growth seems evident. As a matter of fact, during last forty years the EU GDP growth rate was negative only twice: in 1975 and in 1993. In both cases it happened with a one or two-year time lag after an oil price shock. In view of these results, even if the recession after the first oil shock was exacerbated by fiscal and monetary policies in oil importing countries, a negative influence on GDP is evident in all the crises (Table 2).

3.1 Negative effects on society: inflation and unemployment

Other negative effects on economic performance, with a more direct impact in terms of social costs could be seen in trends in the inflation rate and unemployment (see Table 2 and Figure 3). These two factors directly affect governments and citizens, through higher public expenditures on welfare measures such as increasing subsidies for unemployment and reduced market power for consumers. Because of the inelasticity of oil demand, especially in the transport sector, lower-income households could pay a big bill for oil price shocks.

Figure 3. Inflation rate and oil prices in the EU, 1970-2002



Source: Authors' elaborations on data from the World Bank (inflation rate) and BP (oil price).

Table 2. Impact of oil shocks on the main economic factors, EU 1970-2002

Year	Change of real price of imported crude (%)	Change of oil consumption (%)	GDP growth rate	Inflation rate	Unemployment rate (%)	Balance of Payments (current \$ billion)
1970	-5.65	10.57	4.83	4.98	-	-
1971	19.48	4.47	3.73	6.28	-	5.83
1972	7.21	6.82	4.47	6.57	-	0.85
1973	24.76	6.83	5.77	9.24	-	-1.80
1974	217.19	-6.65	1.86	15.11	-	-7.02
1975	-8.74	-4.89	-0.63	13.98	-	5.74
1976	1.48	6.5	4.60	12.21	-	-9.83
1977	0.88	-1.67	2.57	12.33	-	13.55
1978	-4.98	4.22	2.97	9.19	-	24.94
1979	98.39	2.52	3.59	10.38	-	-27.33
1980	4.70	-7.2	1.34	13.13	5.45	-35.71
1981	-13.00	-6.41	0.23	12.93	7.07	26.03
1982	-12.74	-5.04	0.92	11.67	8.11	10.92
1983	-12.23	-2.59	1.88	9.78	9.10	14.83
1984	-6.60	0.66	2.51	9.05	9.58	8.44
1985	-5.22	-1.29	2.48	7.23	9.59	11.42
1986	-48.85	3.68	2.73	4.88	9.42	37.37
1987	23.59	0	2.70	4.06	8.98	-10.47
1988	-21.99	1.35	4.17	4.33	8.41	-23.61
1989	16.12	0.91	3.52	5.7	7.69	-19.41
1990	24.12	1.87	2.57	6.53	7.20	0.21
1991	-19.18	2.35	1.43	5.71	7.63	-32.43
1992	-6.27	1.54	1.26	4.66	8.51	19.07
1993	-14.42	-0.63	-0.41	4.02	9.99	80.12
1994	-8.75	0.06	2.77	3.3	10.24	19.14
1995	4.58	1.28	2.38	3.04	9.74	36.85
1996	17.71	1.82	1.59	2.46	9.83	28.37
1997	-9.36	1.05	2.50	1.98	9.23	6.68
1998	-33.16	1.79	2.90	1.78	8.53	-18.43
1999	36.25	0.32	2.67	1.48	7.54	-66.49
2000	53.58	-0.7	3.45	2.8	7.21	-52.40
2001	-16.86	1.22	1.53	2.97	-	49.13
2002	0.09	-0.93	0.88	2.49	-	-94.88

Sources: Authors' elaborations on data from the World Bank and BP.

Historical data show that oil shocks have different effects in terms of inflation and unemployment. Inflation rates have a sudden response to an oil price increase because of the direct market-transmission mechanism. Conversely, an increase in the unemployment rate is the result of an indirect mechanism, owing to the rigidity of the EU's nominal wages in the labour market, with possible lags (one or two years) after the oil shock: wage pressure and a diminishing GDP growth rate tend to lead to higher unemployment only in successive periods. In any case, such negative results in terms of increasing unemployment should take into account a typical medium-term economic cycle and other structural factors. Looking at

Figure 3, it can be noted that negative effects after 1991 appear higher than after 1981, while increases in both the inflation rate and in the price of oil have been far less.

3.2 A tool for quantitative assessments of past oil crises

In order to show the different effects of past oil shocks and to develop an analytical tool to evaluate supply disruption scenarios, it is useful to analyse the elasticity of oil demand with respect to the price of crude oil, which occurred in OECD countries during previous oil crises, with a focus on the EU (Birol, 1998). In Table 3, section (a) compares the percentage of oil consumption variation while (b) and (c) relate this change to variations in economic activity and real crude oil prices. Finally, the implicit price elasticities for the assumption of unitary-income elasticities have been derived in section (d).

Table 3. Effects of oil price changes on oil demand

	1973-75	1979-82	1985-88	1989-91	1996-98	1998-2000
(a) Change of oil consumption (%)						
OECD North America	-4.26	-11.61	9.54	-1.45	3.95	3.9%
OECD Europe	-9.84	-10.43	5.43	1.72	3.07	-0.3%
OECD Pacific	-7.97	-12.51	8.54	5.52	-3.88	1.0%
European Union	-11.21	-10.96	5.08	1.87	2.86	-0.4%
(b) Change of GDP constant (%)						
OECD North America	0.03	6.62	10.88	1.74	9.06	8.7%
OECD Europe	1.21	5.42	9.79	4.50	5.61	6.1%
OECD Pacific	2.00	11.28	14.28	4.94	1.30	3.3%
European Union	1.22	5.22	9.90	2.57	5.47	6.2%
(c) Change of real price of imported crude (%)						
OECD North America	189.45	80.72	-50.68	24.12	-39.41	109.2%
OECD Europe	189.45	80.72	-50.68	24.12	-39.41	109.2%
OECD Pacific	189.45	80.72	-50.68	24.12	-39.41	109.2%
European Union	189.45	80.72	-50.68	24.12	-39.41	109.2%
(d) Oil price elasticities (a-b)/c						
OECD North America	-0.02	-0.23	0.03	-0.13	0.13	-0.04
OECD Europe	-0.06	-0.20	0.09	-0.12	0.06	-0.06
OECD Pacific	-0.05	-0.29	0.11	0.02	0.13	-0.02
European Union	-0.07	-0.20	0.10	-0.03	0.07	-0.06

Source: Authors' elaborations on data from Birol (1998a) the World Bank and EconStats.

Computed price elasticities (the last rows on Table 3) underline the asymmetry between the demand reactions experienced over the previous price increases and the one experienced over the past price decline. Comparing price elasticities obtained from the high price crisis with those obtained from the low price periods, it is clear that the effects are opposite. During the latter, price elasticities are always positive, while in the former they are always negative. So the dynamic pattern of energy demand appears to be asymmetrical with respect to the sign of a change in oil prices, creating a larger demand adjustment than a comparable price decline.

Different reasons, such as the irreversibility of technological improvement, energy conservation policies of the OECD governments, asymmetrical depreciation and transaction costs associated with conservation programmes may explain this asymmetrical evolution. Moreover, consumers may have an expectation that the oil prices will increase again. If consumers expect higher fuel prices in the (not too distant) future and if adjustment is costly, then it may not be 'advisable' to opt for the short-term opportunities offered by the low price.

The greatest negative impact on the economy was produced by the first oil shock, when the energy systems were characterised by a high rigidity of demand. In such a context, the ineffective policies implemented by the importing countries exacerbated the negative effects.

Indeed, the elasticity of oil demand was much higher during the second crisis (1979-82), when the reduction of oil consumption was similar to the previous one (-11%), while the price rise was much less. Considering the general changes that occurred in the second crisis, higher price elasticities could explain the reduced negative impact in terms of GDP losses, because of higher reductions in oil consumption, and consequently, the reduced negative effect on the economic system.

Interesting results emerged during the following crisis, where the elasticity of demand was again lower. An explanation for this low elasticity can be found in the reduced use of fuel oil in electricity generation, while oil use is more and more concentrated in the transport sector, where demand is rigid and fuel substitutability is difficult. Nevertheless, the third crisis (1989-1992) was characterised by a slower increase in oil prices, owing to the utilisation of oil stocks within OECD countries, so that the percentage change in oil consumption was not negative (apart from North America), and at the same time the GDP growth was even positive and higher than the period 1979-82. Further, during the first Gulf war, the rigidity of demand is partially explained by the utilisation of oil stocks, which were quickly able to give the market enough oil to offset the negative effects of the reductions in oil supplied by exporting countries (Peters, 2003).

In conclusion, among the main factors that influence the economic impact of a crisis, the amount of oil reserves available at the national level and import dependence have to be included: high oil reserves and low import dependence can produce a significant reduction of the negative economic impact of an oil shock (Razavi, 1997).

Finally, the positive effects of oil price reductions for importing countries can be evaluated by considering the positive elasticity of demand and the high GDP growth rate during the periods 1985-88 and 1996-98. In both cases, the positive elasticity of demand indicates that oil consumption grows less than GDP. These data show that a sharp and substantial variation of oil price will probably reduce global income: as the price reduction is not followed by a strong increase in oil demand by importing countries, there will certainly be a loss for exporting countries, probably higher than the gain obtained by importing countries.

3.3 Some estimates of GDP loss

An estimation of GDP elasticity with respect to oil price could be a simple tool to evaluate the negative economic impact of an oil crisis (Razavi, 1997), but within the international literature there are also some supply/demand models capable of generating forecasts of near-term price movements (weeks or months ahead) or simulating supply disruptions. These models are helpful in predicting price responses to supply crisis, by determining the baseline around which prices will fluctuate, according to expectation and speculative factors. For example, DRI/McGraw-Hill maintains a large-scale econometric model of the world spot oil

market and produces regular price forecasts and simulations (IEA, 2001a). The US Department of Energy (DOE) also maintains a spreadsheet model designed explicitly to predict oil price and demand responses in the event of a major disruption (IEA, 2001a).

Based on the DRI model, a sudden cut in oil production of around 1 mb/d leads approximately to an average increase in crude oil price of \$1.50-\$2.00 per barrel within about three months, assuming prices in the \$15-\$20 per barrel range. In the DOE model, prices are more sensitive to supply losses. Each 1 mb/d of lost supply increases spot crude oil prices by \$3.50-\$4.00 per barrel in the first quarter and progressively less for the second and third quarters.

The lack of a clear correlation between initial supply losses and the resulting oil price increases occurs, because during past crises these losses were in most instances rapidly offset by production increases in countries not affected by the crises (IEA, 2001b).

Other studies have focused on analysing the economic impact of oil price increases. For instance, one of the official EU documents about security of oil supply has estimates that an increase of \$10 in the price of a barrel of crude oil is likely to reduce economic growth in the industrialised countries by around 0.5%. Another study produced by the International Monetary Found estimates that a \$10 per barrel increase in the oil price, if sustained for a year, reduces global GDP by 0.6% – ignoring the secondary effects on confidence, stock markets and policy responses (EU, 2002).

4. Social costs of electricity shortages

The social costs of energy disruptions related to electricity shortages are easier to distinguish as a result of their immediate negative impact and relatively small, indirect and successive effects. Generally, the social costs of an electricity disruption depend on the quality and composition of various factors:

- the extension of the disruption in terms of the area affected (and the demographic density of the territory);
- the existence of alternative energy sources that could or could not replace the missing energy (i.e. the solar energy disposals in a small area in New York guaranteed their inhabitants a continuous energy flow during the last disruption on 14 August 2003);
- the duration and the continuity of the disruption;
- the specific time of day at which the disruption occurred;
- the season, given that climate is a very important factor for both the magnitude of the disruption and the scale of consequences (usually summer black-outs are more serious due to air conditioning); and
- the availability of advance warning and information.

In order to evaluate all the public and governmental sectors affected by an energy shortage, it is useful to overview what happened during previous black-outs in North America and in Europe. A possible list of social costs that could occur after an energy disruption is below.

1. Expenditure for military, police and emergence actions (excluding health)

- Costs of activating a counter-terrorism response, because of the lack of an immediate warning about the black-out
- Costs of emergency requests to police and public order forces (arrests, riots)
- Costs of emergencies for fire workers (i.e. fires, elevators, closing doors, subway, etc.)

2. *Expenditures for public transport*

- Costs to public railways owing to interruption include reduced revenues, increased emergencies, delays (affecting both the public transport system and consumers) and increased risks of accidents (i.e. computer interruptions in the traffic planning-system)
- Costs of subway interruptions include reduced revenues, increased emergencies, increased risk of accidents, delays (affecting both the public transport system and consumers)
- Costs of flights, increased emergencies, delays (effects on consumers) increased risk of accidents

3. *Health care expenditures*

- Immediate costs to the health care infrastructure (hospitals, emergencies, laboratories) such as emergency surgery, emergency medical-service calls, loss of medicines, organs, blood and analysis (and experiments) owing to reduced refrigerating capacity (prolonged shortage)
- Post black-out health expenditures (relating to violence, injuries as a result of fires, food poisoning, panic attacks and uncomfortable temperatures)

4. *Sanitation and waste disposals*

- Immediate costs for the interruption in sanitation services and waste disposal, as well as recycling systems or composting/incinerator disposals
- Further costs owing to excessive waste accumulation
- Possible sanitary costs relating to the reduced capacity of wastewater treatment facilities

5. *Other public services*

- Costs relating to the interruption of classes in public schools and universities
- Food losses (reduced refrigeration capacity) throughout public facilities
- Social costs for illness (reduced work capacity)
- Costs pertaining to the interruption of other public administrative services (councils, assistance, etc.)
- Loss of museum revenues
- Political 'fallout'

6. *Human life values*

- Costs relating to mortalities
- Costs as a result of illness
- Losses of leisure time, personal injury, fear and panic

Additionally, all of the sectors described above could face further high costs (Rios et al., 1999), which are linked to:

- idle but paid-for resources such as labour or capital
- equipment damage
- process-restart costs
- spoilage of resources
- utility restoration costs

In order to analyse the links between the direct and indirect effects of energy disruptions, a classic example could be the negative impact of electricity shortages on farmers and

consequently on consumers. In this case, however, the time lag of the consequences could be longer, even up to one year. The example taken from US experience can be perfectly adapted to the situation in the EU, owing to the high subsidies that characterise the agricultural sector in the two regions. The economic losses borne by farmers in terms of reduced income are partly replaced by public subsidies, changing the private cost (to farmers) into a social cost (taxes for citizens).

Looking at disruptions of energy supply to agriculture of even short durations, the effects on farmers could be a substantial reduction or even a complete loss of an entire growing season (such as a shortage of electricity to pump water during a drought season or to milk cows, etc.).

Following studies from the US National Council of Farmer Cooperatives (NCFC) and the US Agriculture Department, agriculture and the rest of the rural sector are typically at the end of the energy distribution chain, with fewer alternative supply options and greater vulnerability to disruptions. An initial (direct) effect could be the shortage of energy-dependent services (i.e. irrigation or milking cows) and a consequent loss of crops. Another (indirect) effect depends on energy price increases. In the event of energy price spikes, farmers, as price-takers for their commodity, are unable to pass price increases for energy or fertilizer on to the consumer, and therefore receive an even lower return for their products.

The US Department of Agriculture recently estimated that the price increases for energy inputs and fertilizer owing to energy disruptions during the past few months in California – if projected into the year – could result in a 1-2% increase in total costs of production. This may not seem significant, but it becomes a serious matter when considering that this cost increase would translate into a one-third decrease in net farm cash-income.

References

- Birol, F. (1998), *Oil Price Changes and the Macroeconomy: A Brief Overview*, IEA paper, Paris.
- British Petroleum (BP) (2003), *Statistical Review of World Energy*, June.
- Chaudhuri, K. (2001), “Long-run prices of primary commodities and oil prices”, *Applied Economics*, No. 33, pp. 531-538.
- Clô, A. (2000), *Economia e politica del petrolio*, Compositori ed., Bologna.
- EconStat (2003), *Economic and Financial Data, Crude oil spot price*.
- European Commission (2002), *The internal market in energy: Coordinated measures on the security of energy supply*, COM(2002) 488 final, Brussels.
- Ferderer, J.P. (1996), “Oil price volatility and the macroeconomy”, *Journal of Macroeconomy*, No. 18, pp. 1-26.
- Harks, E. (2003), “Security of Oil Supply, Oil Crisis Mitigation Stocks”, presentation at INDES (Insuring against Disruptions of Energy Supply) Workshop, Amsterdam 6-7 May.
- Helm, D. (2002), “Energy policy: Security of supply, sustainability and competition”, *Energy Policy*, No. 30, pp. 173-184.
- Huntington, H.G. (1998), “Crude oil prices and US economic performance: where does the asymmetry reside?”, *Economic Journal*, Vol. 19, No. 4, pp. 107-132.
- International Energy Agency (2001a), *Toward a Sustainable Energy Future*, OECD/IEA, Paris.
- International Energy Agency (2001b), *Energy price volatility: Trends and consequences*, IEA paper, Paris.
- Markandya, A. (2003), *Methodologies on risk assessment and cost estimates of supply disruptions*, INDES Stakeholder Workshop, CEPS, Brussels, 28 October.
- Peters, S. (2003), *Courting future resource conflict: The shortcomings of Western response strategies to new energy vulnerabilities*, Political Science Department, Giessen University.
- Pireddu, G. (1990), *L'energia nell'analisi economica*, Franco Angeli.
- Rios et al. (1999), *Computation of the value of security*, University of Manchester Institute of Science and Technology (UMIST), October.
- Razavi, H. (1997), *Economic, Security and Environmental Aspects of Energy Supply: A Conceptual Framework for Strategic analysis of Fossil Fuels*, World Bank PARES Project, Washington, D.C.
- Toman, M.A. (2002), *International Oil Security: Problems and Policies, Resources for the Future*, Issue Brief No. 02-04.
- World Bank (2003), *World Development Indicators*, World Bank Development Report, World Bank, New York.

NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI

Fondazione Eni Enrico Mattei Working Paper Series

Our Note di Lavoro are available on the Internet at the following addresses:

<http://www.feem.it/Feem/Pub/Publications/WPapers/default.html>

<http://www.ssrn.com/link/feem.html>

NOTE DI LAVORO PUBLISHED IN 2003

PRIV	1.2003	<i>Gabriella CHIESA and Giovanna NICODANO: <u>Privatization and Financial Market Development: Theoretical Issues</u></i>
PRIV	2.2003	<i>Ibolya SCHINDELE: <u>Theory of Privatization in Eastern Europe: Literature Review</u></i>
PRIV	3.2003	<i>Wietze LISE, Claudia KEMFERT and Richard S.J. TOL: <u>Strategic Action in the Liberalised German Electricity Market</u></i>
CLIM	4.2003	<i>Laura MARSILIANI and Thomas I. RENSTRÖM: <u>Environmental Policy and Capital Movements: The Role of Government Commitment</u></i>
KNOW	5.2003	<i>Reyer GERLAGH: <u>Induced Technological Change under Technological Competition</u></i>
ETA	6.2003	<i>Efrem CASTELNUOVO: <u>Squeezing the Interest Rate Smoothing Weight with a Hybrid Expectations Model</u></i>
SIEV	7.2003	<i>Anna ALBERINI, Alberto LONGO, Stefania TONIN, Francesco TROMBETTA and Margherita TURVANI: <u>The Role of Liability, Regulation and Economic Incentives in Brownfield Remediation and Redevelopment: Evidence from Surveys of Developers</u></i>
NRM	8.2003	<i>Elissaios POPYRAKIS and Reyner GERLAGH: <u>Natural Resources: A Blessing or a Curse?</u></i>
CLIM	9.2003	<i>A. CAPARRÓS, J.-C. PEREAU and T. TAZDAÏT: <u>North-South Climate Change Negotiations: a Sequential Game with Asymmetric Information</u></i>
KNOW	10.2003	<i>Giorgio BRUNELLO and Daniele CHECCHI: <u>School Quality and Family Background in Italy</u></i>
CLIM	11.2003	<i>Efrem CASTELNUOVO and Marzio GALEOTTI: <u>Learning By Doing vs Learning By Researching in a Model of Climate Change Policy Analysis</u></i>
KNOW	12.2003	<i>Carole MAIGNAN, Gianmarco OTTAVIANO and Dino PINELLI (eds.): <u>Economic Growth, Innovation, Cultural Diversity: What are we all talking about? A critical survey of the state-of-the-art</u></i>
KNOW	13.2003	<i>Carole MAIGNAN, Gianmarco OTTAVIANO, Dino PINELLI and Francesco RULLANI (lix): <u>Bio-Ecological Diversity vs. Socio-Economic Diversity. A Comparison of Existing Measures</u></i>
KNOW	14.2003	<i>Maddy JANSSENS and Chris STEYAERT (lix): <u>Theories of Diversity within Organisation Studies: Debates and Future Trajectories</u></i>
KNOW	15.2003	<i>Tuzin BAYCAN LEVENT, Enno MASUREL and Peter NIJKAMP (lix): <u>Diversity in Entrepreneurship: Ethnic and Female Roles in Urban Economic Life</u></i>
KNOW	16.2003	<i>Alexandra BITUSIKOVA (lix): <u>Post-Communist City on its Way from Grey to Colourful: The Case Study from Slovakia</u></i>
KNOW	17.2003	<i>Billy E. VAUGHN and Katarina MLEKOV (lix): <u>A Stage Model of Developing an Inclusive Community</u></i>
KNOW	18.2003	<i>Selma van LONDEN and Arie de RUIJTER (lix): <u>Managing Diversity in a Globalizing World</u></i>
Coalition		
Theory	19.2003	<i>Sergio CURRARINI: <u>On the Stability of Hierarchies in Games with Externalities</u></i>
Network		
PRIV	20.2003	<i>Giacomo CALZOLARI and Alessandro PAVAN (lx): <u>Monopoly with Resale</u></i>
PRIV	21.2003	<i>Claudio MEZZETTI (lx): <u>Auction Design with Interdependent Valuations: The Generalized Revelation Principle, Efficiency, Full Surplus Extraction and Information Acquisition</u></i>
PRIV	22.2003	<i>Marco LiCalzi and Alessandro PAVAN (lx): <u>Tilting the Supply Schedule to Enhance Competition in Uniform-Price Auctions</u></i>
PRIV	23.2003	<i>David ETTINGER (lx): <u>Bidding among Friends and Enemies</u></i>
PRIV	24.2003	<i>Hannu VARTIAINEN (lx): <u>Auction Design without Commitment</u></i>
PRIV	25.2003	<i>Matti KELOHARJU, Kjell G. NYBORG and Kristian RYDQVIST (lx): <u>Strategic Behavior and Underpricing in Uniform Price Auctions: Evidence from Finnish Treasury Auctions</u></i>
PRIV	26.2003	<i>Christine A. PARLOUR and Uday RAJAN (lx): <u>Rationing in IPOs</u></i>
PRIV	27.2003	<i>Kjell G. NYBORG and Ilya A. STREBULAIEV (lx): <u>Multiple Unit Auctions and Short Squeezes</u></i>
PRIV	28.2003	<i>Anders LUNANDER and Jan-Eric NILSSON (lx): <u>Taking the Lab to the Field: Experimental Tests of Alternative Mechanisms to Procure Multiple Contracts</u></i>
PRIV	29.2003	<i>TangaMcDANIEL and Karsten NEUHOFF (lx): <u>Use of Long-term Auctions for Network Investment</u></i>
PRIV	30.2003	<i>Emiel MAASLAND and Sander ONDERSTAL (lx): <u>Auctions with Financial Externalities</u></i>
ETA	31.2003	<i>Michael FINUS and Bianca RUNDSHAGEN: <u>A Non-cooperative Foundation of Core-Stability in Positive Externality NTU-Coalition Games</u></i>
KNOW	32.2003	<i>Michele MORETTO: <u>Competition and Irreversible Investments under Uncertainty</u></i>
PRIV	33.2003	<i>Philippe QUIRION: <u>Relative Quotas: Correct Answer to Uncertainty or Case of Regulatory Capture?</u></i>
KNOW	34.2003	<i>Giuseppe MEDA, Claudio PIGA and Donald SIEGEL: <u>On the Relationship between R&D and Productivity: A Treatment Effect Analysis</u></i>
ETA	35.2003	<i>Alessandra DEL BOCA, Marzio GALEOTTI and Paola ROTA: <u>Non-convexities in the Adjustment of Different Capital Inputs: A Firm-level Investigation</u></i>

GG	36.2003	<i>Matthieu GLACHANT</i> : <u>Voluntary Agreements under Endogenous Legislative Threats</u>
PRIV	37.2003	<i>Narjess BOUBAKRI, Jean-Claude COSSET and Omrane GUEDHAMI</i> : <u>Postprivatization Corporate Governance: the Role of Ownership Structure and Investor Protection</u>
CLIM	38.2003	<i>Rolf GOLOMBEK and Michael HOEL</i> : <u>Climate Policy under Technology Spillovers</u>
KNOW	39.2003	<i>Slim BEN YOUSSEF</i> : <u>Transboundary Pollution, R&D Spillovers and International Trade</u>
CTN	40.2003	<i>Carlo CARRARO and Carmen MARCHIORI</i> : <u>Endogenous Strategic Issue Linkage in International Negotiations</u>
KNOW	41.2003	<i>Sonia OREFFICE</i> : <u>Abortion and Female Power in the Household: Evidence from Labor Supply</u>
KNOW	42.2003	<i>Timo GOESCHL and Timothy SWANSON</i> : <u>On Biology and Technology: The Economics of Managing Biotechnologies</u>
ETA	43.2003	<i>Giorgio Busetti and Matteo MANERA</i> : <u>STAR-GARCH Models for Stock Market Interactions in the Pacific Basin Region, Japan and US</u>
CLIM	44.2003	<i>Katrin MILLOCK and Céline NAUGES</i> : <u>The French Tax on Air Pollution: Some Preliminary Results on its Effectiveness</u>
PRIV	45.2003	<i>Bernardo BORTOLOTTI and Paolo PINOTTI</i> : <u>The Political Economy of Privatization</u>
SIEV	46.2003	<i>Elbert DIJKGRAAF and Herman R.J. VOLLEBERGH</i> : <u>Burn or Bury? A Social Cost Comparison of Final Waste Disposal Methods</u>
ETA	47.2003	<i>Jens HORBACH</i> : <u>Employment and Innovations in the Environmental Sector: Determinants and Econometrical Results for Germany</u>
CLIM	48.2003	<i>Lori SNYDER, Nolan MILLER and Robert STAVINS</i> : <u>The Effects of Environmental Regulation on Technology Diffusion: The Case of Chlorine Manufacturing</u>
CLIM	49.2003	<i>Lori SNYDER, Robert STAVINS and Alexander F. WAGNER</i> : <u>Private Options to Use Public Goods. Exploiting Revealed Preferences to Estimate Environmental Benefits</u>
CTN	50.2003	<i>László Á. KÓCZY and Luc LAUWERS</i> (Ixi): <u>The Minimal Dominant Set is a Non-Empty Core-Extension</u>
CTN	51.2003	<i>Matthew O. JACKSON</i> (Ixi): <u>Allocation Rules for Network Games</u>
CTN	52.2003	<i>Ana MAULEON and Vincent VANNETELBOSCH</i> (Ixi): <u>Farsightedness and Cautiousness in Coalition Formation</u>
CTN	53.2003	<i>Fernando VEGA-REDONDO</i> (Ixi): <u>Building Up Social Capital in a Changing World: a network approach</u>
CTN	54.2003	<i>Matthew HAAG and Roger LAGUNOFF</i> (Ixi): <u>On the Size and Structure of Group Cooperation</u>
CTN	55.2003	<i>Tajji FURUSAWA and Hideo KONISHI</i> (Ixi): <u>Free Trade Networks</u>
CTN	56.2003	<i>Halis Murat YILDIZ</i> (Ixi): <u>National Versus International Mergers and Trade Liberalization</u>
CTN	57.2003	<i>Santiago RUBIO and Alistair ULPH</i> (Ixi): <u>An Infinite-Horizon Model of Dynamic Membership of International Environmental Agreements</u>
KNOW	58.2003	<i>Carole MAIGNAN, Dino PINELLI and Gianmarco I.P. OTTAVIANO</i> : <u>ICT, Clusters and Regional Cohesion: A Summary of Theoretical and Empirical Research</u>
KNOW	59.2003	<i>Giorgio BELLETTINI and Gianmarco I.P. OTTAVIANO</i> : <u>Special Interests and Technological Change</u>
ETA	60.2003	<i>Ronnie SCHÖB</i> : <u>The Double Dividend Hypothesis of Environmental Taxes: A Survey</u>
CLIM	61.2003	<i>Michael FINUS, Ekko van IERLAND and Robert DELLINK</i> : <u>Stability of Climate Coalitions in a Cartel Formation Game</u>
GG	62.2003	<i>Michael FINUS and Bianca RUNDSHAGEN</i> : <u>How the Rules of Coalition Formation Affect Stability of International Environmental Agreements</u>
SIEV	63.2003	<i>Alberto PETRUCCI</i> : <u>Taxing Land Rent in an Open Economy</u>
CLIM	64.2003	<i>Joseph E. ALDY, Scott BARRETT and Robert N. STAVINS</i> : <u>Thirteen Plus One: A Comparison of Global Climate Policy Architectures</u>
SIEV	65.2003	<i>Edi DEFRANCESCO</i> : <u>The Beginning of Organic Fish Farming in Italy</u>
SIEV	66.2003	<i>Klaus CONRAD</i> : <u>Price Competition and Product Differentiation when Consumers Care for the Environment</u>
SIEV	67.2003	<i>Paulo A.L.D. NUNES, Luca ROSSETTO, Arianne DE BLAEIJ</i> : <u>Monetary Value Assessment of Clam Fishing Management Practices in the Venice Lagoon: Results from a Stated Choice Exercise</u>
CLIM	68.2003	<i>ZhongXiang ZHANG</i> : <u>Open Trade with the U.S. Without Compromising Canada's Ability to Comply with its Kyoto Target</u>
KNOW	69.2003	<i>David FRANTZ</i> (Iix): <u>Lorenzo Market between Diversity and Mutation</u>
KNOW	70.2003	<i>Ercole SORI</i> (Iix): <u>Mapping Diversity in Social History</u>
KNOW	71.2003	<i>Ljiljana DERU SIMIC</i> (Ixi): <u>What is Specific about Art/Cultural Projects?</u>
KNOW	72.2003	<i>Natalya V. TARANOVA</i> (Ixi): <u>The Role of the City in Fostering Intergroup Communication in a Multicultural Environment: Saint-Petersburg's Case</u>
KNOW	73.2003	<i>Kristine CRANE</i> (Ixi): <u>The City as an Arena for the Expression of Multiple Identities in the Age of Globalisation and Migration</u>
KNOW	74.2003	<i>Kazuma MATOBA</i> (Ixi): <u>Glocal Dialogue- Transformation through Transcultural Communication</u>
KNOW	75.2003	<i>Catarina REIS OLIVEIRA</i> (Ixi): <u>Immigrants' Entrepreneurial Opportunities: The Case of the Chinese in Portugal</u>
KNOW	76.2003	<i>Sandra WALLMAN</i> (Ixi): <u>The Diversity of Diversity - towards a typology of urban systems</u>
KNOW	77.2003	<i>Richard PEARCE</i> (Ixi): <u>A Biologist's View of Individual Cultural Identity for the Study of Cities</u>
KNOW	78.2003	<i>Vincent MERK</i> (Ixi): <u>Communication Across Cultures: from Cultural Awareness to Reconciliation of the Dilemmas</u>
KNOW	79.2003	<i>Giorgio BELLETTINI, Carlotta BERTI CERONI and Gianmarco I.P. OTTAVIANO</i> : <u>Child Labor and Resistance to Change</u>
ETA	80.2003	<i>Michele MORETTO, Paolo M. PANTEGHINI and Carlo SCARPA</i> : <u>Investment Size and Firm's Value under Profit Sharing Regulation</u>

IEM	81.2003	<i>Alessandro LANZA, Matteo MANERA and Massimo GIOVANNINI: <u>Oil and Product Dynamics in International Petroleum Markets</u></i>
CLIM	82.2003	<i>Y. Hossein FARZIN and Jinhua ZHAO: <u>Pollution Abatement Investment When Firms Lobby Against Environmental Regulation</u></i>
CLIM	83.2003	<i>Giuseppe DI VITA: <u>Is the Discount Rate Relevant in Explaining the Environmental Kuznets Curve?</u></i>
CLIM	84.2003	<i>Reyer GERLAGH and Wietze LISE: <u>Induced Technological Change Under Carbon Taxes</u></i>
NRM	85.2003	<i>Rinaldo BRAU, Alessandro LANZA and Francesco PIGLIARU: <u>How Fast are the Tourism Countries Growing? The cross-country evidence</u></i>
KNOW	86.2003	<i>Elena BELLINI, Gianmarco I.P. OTTAVIANO and Dino PINELLI: <u>The ICT Revolution: opportunities and risks for the Mezzogiorno</u></i>
SIEV	87.2003	<i>Lucas BRETSCGHER and Sjak SMULDERS: <u>Sustainability and Substitution of Exhaustible Natural Resources. How resource prices affect long-term R&D investments</u></i>
CLIM	88.2003	<i>Johan EYCKMANS and Michael FINUS: <u>New Roads to International Environmental Agreements: The Case of Global Warming</u></i>
CLIM	89.2003	<i>Marzio GALEOTTI: <u>Economic Development and Environmental Protection</u></i>
CLIM	90.2003	<i>Marzio GALEOTTI: <u>Environment and Economic Growth: Is Technical Change the Key to Decoupling?</u></i>
CLIM	91.2003	<i>Marzio GALEOTTI and Barbara BUCHNER: <u>Climate Policy and Economic Growth in Developing Countries</u></i>
IEM	92.2003	<i>A. MARKANDYA, A. GOLUB and E. STRUKOVA: <u>The Influence of Climate Change Considerations on Energy Policy: The Case of Russia</u></i>
ETA	93.2003	<i>Andrea BELTRATTI: <u>Socially Responsible Investment in General Equilibrium</u></i>
CTN	94.2003	<i>Parkash CHANDER: <u>The γ-Core and Coalition Formation</u></i>
IEM	95.2003	<i>Matteo MANERA and Angelo MARZULLO: <u>Modelling the Load Curve of Aggregate Electricity Consumption Using Principal Components</u></i>
IEM	96.2003	<i>Alessandro LANZA, Matteo MANERA, Margherita GRASSO and Massimo GIOVANNINI: <u>Long-run Models of Oil Stock Prices</u></i>
CTN	97.2003	<i>Steven J. BRAMS, Michael A. JONES, and D. Marc KILGOUR: <u>Forming Stable Coalitions: The Process Matters</u></i>
KNOW	98.2003	<i>John CROWLEY, Marie-Cecile NAVES (Ixxiii): <u>Anti-Racist Policies in France. From Ideological and Historical Schemes to Socio-Political Realities</u></i>
KNOW	99.2003	<i>Richard THOMPSON FORD (Ixxiii): <u>Cultural Rights and Civic Virtue</u></i>
KNOW	100.2003	<i>Alaknanda PATEL (Ixxiii): <u>Cultural Diversity and Conflict in Multicultural Cities</u></i>
KNOW	101.2003	<i>David MAY (Ixxiii): <u>The Struggle of Becoming Established in a Deprived Inner-City Neighbourhood</u></i>
KNOW	102.2003	<i>Sébastien ARCAND, Danielle JUTEAU, Sirma BILGE, and Francine LEMIRE (Ixxiii) : <u>Municipal Reform on the Island of Montreal: Tensions Between Two Majority Groups in a Multicultural City</u></i>
CLIM	103.2003	<i>Barbara BUCHNER and Carlo CARRARO: <u>China and the Evolution of the Present Climate Regime</u></i>
CLIM	104.2003	<i>Barbara BUCHNER and Carlo CARRARO: <u>Emissions Trading Regimes and Incentives to Participate in International Climate Agreements</u></i>
CLIM	105.2003	<i>Anil MARKANDYA and Dirk T.G. RÜBBELKE: <u>Ancillary Benefits of Climate Policy</u></i>
NRM	106.2003	<i>Anne Sophie CRÉPIN (Ixiv): <u>Management Challenges for Multiple-Species Boreal Forests</u></i>
NRM	107.2003	<i>Anne Sophie CRÉPIN (Ixiv): <u>Threshold Effects in Coral Reef Fisheries</u></i>
SIEV	108.2003	<i>Sara ANIYAR (Ixiv): <u>Estimating the Value of Oil Capital in a Small Open Economy: The Venezuela's Example</u></i>
SIEV	109.2003	<i>Kenneth ARROW, Partha DASGUPTA and Karl-Göran MÄLER(Ixiv): <u>Evaluating Projects and Assessing Sustainable Development in Imperfect Economies</u></i>
NRM	110.2003	<i>Anastasios XEPAPADEAS and Catarina ROSETA-PALMA(Ixiv): <u>Instabilities and Robust Control in Fisheries</u></i>
NRM	111.2003	<i>Charles PERRINGS and Brian WALKER (Ixiv): <u>Conservation and Optimal Use of Rangelands</u></i>
ETA	112.2003	<i>Jack GOODY (Ixiv): <u>Globalisation, Population and Ecology</u></i>
CTN	113.2003	<i>Carlo CARRARO, Carmen MARCHIORI and Sonia OREFFICE: <u>Endogenous Minimum Participation in International Environmental Treaties</u></i>
CTN	114.2003	<i>Guillaume HAERINGER and Myrna WOODERS: <u>Decentralized Job Matching</u></i>
CTN	115.2003	<i>Hideo KONISHI and M. Utku UNVER: <u>Credible Group Stability in Multi-Partner Matching Problems</u></i>
CTN	116.2003	<i>Somdeb LAHIRI: <u>Stable Matchings for the Room-Mates Problem</u></i>
CTN	117.2003	<i>Somdeb LAHIRI: <u>Stable Matchings for a Generalized Marriage Problem</u></i>
CTN	118.2003	<i>Marita LAUKKANEN: <u>Transboundary Fisheries Management under Implementation Uncertainty</u></i>
CTN	119.2003	<i>Edward CARTWRIGHT and Myrna WOODERS: <u>Social Conformity and Bounded Rationality in Arbitrary Games with Incomplete Information: Some First Results</u></i>
CTN	120.2003	<i>Gianluigi VERNASCA: <u>Dynamic Price Competition with Price Adjustment Costs and Product Differentiation</u></i>
CTN	121.2003	<i>Myrna WOODERS, Edward CARTWRIGHT and Reinhard SELTEN: <u>Social Conformity in Games with Many Players</u></i>
CTN	122.2003	<i>Edward CARTWRIGHT and Myrna WOODERS: <u>On Equilibrium in Pure Strategies in Games with Many Players</u></i>
CTN	123.2003	<i>Edward CARTWRIGHT and Myrna WOODERS: <u>Conformity and Bounded Rationality in Games with Many Players</u></i>
	1000	Carlo CARRARO, Alessandro LANZA and Valeria PAPPONETTI: <u>One Thousand Working Papers</u>

NOTE DI LAVORO PUBLISHED IN 2004

IEM	1.2004	<i>Anil MARKANDYA, Suzette PEDROSO and Alexander GOLUB: <u>Empirical Analysis of National Income and So2 Emissions in Selected European Countries</u></i>
ETA	2.2004	<i>Masahisa FUJITA and Shlomo WEBER: <u>Strategic Immigration Policies and Welfare in Heterogeneous Countries</u></i>
PRA	3.2004	<i>Adolfo DI CARLUCCIO, Giovanni FERRI, Cecilia FRALE and Ottavio RICCHI: <u>Do Privatizations Boost Household Shareholding? Evidence from Italy</u></i>
ETA	4.2004	<i>Victor GINSBURGH and Shlomo WEBER: <u>Languages Disenfranchisement in the European Union</u></i>
ETA	5.2004	<i>Romano PIRAS: <u>Growth, Congestion of Public Goods, and Second-Best Optimal Policy</u></i>
CCMP	6.2004	<i>Herman R.J. VOLLEBERGH: <u>Lessons from the Polder: Is Dutch CO2-Taxation Optimal</u></i>
PRA	7.2004	<i>Sandro BRUSCO, Giuseppe LOPOMO and S. VISWANATHAN (lxv): <u>Merger Mechanisms</u></i>
PRA	8.2004	<i>Wolfgang AUSSENEGG, Pegaret PICHLER and Alex STOMPER (lxv): <u>IPO Pricing with Bookbuilding, and a When-Issued Market</u></i>
PRA	9.2004	<i>Pegaret PICHLER and Alex STOMPER (lxv): <u>Primary Market Design: Direct Mechanisms and Markets</u></i>
PRA	10.2004	<i>Florian ENGLMAIER, Pablo GUILLEN, Loreto LLORENTE, Sander ONDERSTAL and Rupert SAUSGRUBER (lxv): <u>The Chopstick Auction: A Study of the Exposure Problem in Multi-Unit Auctions</u></i>
PRA	11.2004	<i>Bjarne BRENDSTRUP and Harry J. PAARSCH (lxv): <u>Nonparametric Identification and Estimation of Multi-Unit, Sequential, Oral, Ascending-Price Auctions With Asymmetric Bidders</u></i>
PRA	12.2004	<i>Ohad KADAN (lxv): <u>Equilibrium in the Two Player, k-Double Auction with Affiliated Private Values</u></i>
PRA	13.2004	<i>Maarten C.W. JANSSEN (lxv): <u>Auctions as Coordination Devices</u></i>
PRA	14.2004	<i>Gadi FIBICH, Arieh GAVIOUS and Aner SELA (lxv): <u>All-Pay Auctions with Weakly Risk-Averse Buyers</u></i>
PRA	15.2004	<i>Orly SADE, Charles SCHNITZLEIN and Jaime F. ZENDER (lxv): <u>Competition and Cooperation in Divisible Good Auctions: An Experimental Examination</u></i>
PRA	16.2004	<i>Marta STRYSZOWSKA (lxv): <u>Late and Multiple Bidding in Competing Second Price Internet Auctions</u></i>
CCMP	17.2004	<i>Slim Ben YOUSSEF: <u>R&D in Cleaner Technology and International Trade</u></i>
NRM	18.2004	<i>Angelo ANTOCI, Simone BORGHESI and Paolo RUSSU (lxvi): <u>Biodiversity and Economic Growth: Stabilization Versus Preservation of the Ecological Dynamics</u></i>
SIEV	19.2004	<i>Anna ALBERINI, Paolo ROSATO, Alberto LONGO and Valentina ZANATTA: <u>Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice</u></i>
NRM	20.2004	<i>Guido CANDELA and Roberto CELLINI (lxvii): <u>Investment in Tourism Market: A Dynamic Model of Differentiated Oligopoly</u></i>
NRM	21.2004	<i>Jacqueline M. HAMILTON (lxvii): <u>Climate and the Destination Choice of German Tourists</u></i>
NRM	22.2004	<i>Javier Rey-MAQUIEIRA PALMER, Javier LOZANO IBÁÑEZ and Carlos Mario GÓMEZ GÓMEZ (lxvii): <u>Land, Environmental Externalities and Tourism Development</u></i>
NRM	23.2004	<i>Pius ODUNGA and Henk FOLMER (lxvii): <u>Profiling Tourists for Balanced Utilization of Tourism-Based Resources in Kenya</u></i>
NRM	24.2004	<i>Jean-Jacques NOWAK, Mondher SAHLI and Pasquale M. SGRO (lxvii): <u>Tourism, Trade and Domestic Welfare</u></i>
NRM	25.2004	<i>Riaz SHAREEF (lxvii): <u>Country Risk Ratings of Small Island Tourism Economies</u></i>
NRM	26.2004	<i>Juan Luis EUGENIO-MARTÍN, Noelia MARTÍN MORALES and Riccardo SCARPA (lxvii): <u>Tourism and Economic Growth in Latin American Countries: A Panel Data Approach</u></i>
NRM	27.2004	<i>Raúl Hernández MARTÍN (lxvii): <u>Impact of Tourism Consumption on GDP. The Role of Imports</u></i>
CSRM	28.2004	<i>Nicoletta FERRO: <u>Cross-Country Ethical Dilemmas in Business: A Descriptive Framework</u></i>
NRM	29.2004	<i>Marian WEBER (lxvi): <u>Assessing the Effectiveness of Tradable Landuse Rights for Biodiversity Conservation: an Application to Canada's Boreal Mixedwood Forest</u></i>
NRM	30.2004	<i>Trond BJORN DAL, Phoebe KOUNDOURI and Sean PASCOE (lxvi): <u>Output Substitution in Multi-Species Trawl Fisheries: Implications for Quota Setting</u></i>
CCMP	31.2004	<i>Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI: <u>Weather Impacts on Natural, Social and Economic Systems (WISE) Part I: Sectoral Analysis of Climate Impacts in Italy</u></i>
CCMP	32.2004	<i>Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI: <u>Weather Impacts on Natural, Social and Economic Systems (WISE) Part II: Individual Perception of Climate Extremes in Italy</u></i>
CTN	33.2004	<i>Wilson PEREZ: <u>Divide and Conquer: Noisy Communication in Networks, Power, and Wealth Distribution</u></i>
KTHC	34.2004	<i>Gianmarco I.P. OTTAVIANO and Giovanni PERI (lxviii): <u>The Economic Value of Cultural Diversity: Evidence from US Cities</u></i>
KTHC	35.2004	<i>Linda CHAIB (lxviii): <u>Immigration and Local Urban Participatory Democracy: A Boston-Paris Comparison</u></i>
KTHC	36.2004	<i>Franca ECKERT COEN and Claudio ROSSI (lxviii): <u>Foreigners, Immigrants, Host Cities: The Policies of Multi-Ethnicity in Rome. Reading Governance in a Local Context</u></i>
KTHC	37.2004	<i>Kristine CRANE (lxviii): <u>Governing Migration: Immigrant Groups' Strategies in Three Italian Cities – Rome, Naples and Bari</u></i>
KTHC	38.2004	<i>Kiflemariam HAMDE (lxviii): <u>Mind in Africa, Body in Europe: The Struggle for Maintaining and Transforming Cultural Identity - A Note from the Experience of Eritrean Immigrants in Stockholm</u></i>
ETA	39.2004	<i>Alberto CAVALIERE: <u>Price Competition with Information Disparities in a Vertically Differentiated Duopoly</u></i>
PRA	40.2004	<i>Andrea BIGANO and Stef PROOST: <u>The Opening of the European Electricity Market and Environmental Policy: Does the Degree of Competition Matter?</u></i>
CCMP	41.2004	<i>Micheal FINUS (lxix): <u>International Cooperation to Resolve International Pollution Problems</u></i>

KTHC	42.2004	<i>Francesco CRESPI</i> : <u>Notes on the Determinants of Innovation: A Multi-Perspective Analysis</u>
CTN	43.2004	<i>Sergio CURRARINI and Marco MARINI</i> : <u>Coalition Formation in Games without Synergies</u>
CTN	44.2004	<i>Marc ESCRHUELA-VILLAR</i> : <u>Cartel Sustainability and Cartel Stability</u>
NRM	45.2004	<i>Sebastian BERVOETS and Nicolas GRAVEL</i> (lxvi): <u>Appraising Diversity with an Ordinal Notion of Similarity: An Axiomatic Approach</u>
NRM	46.2004	<i>Signe ANTHON and Bo JELLESMARK THORSEN</i> (lxvi): <u>Optimal Afforestation Contracts with Asymmetric Information on Private Environmental Benefits</u>
NRM	47.2004	<i>John MBURU</i> (lxvi): <u>Wildlife Conservation and Management in Kenya: Towards a Co-management Approach</u>
NRM	48.2004	<i>Ekin BIROL, Ágnes GYOVAI and Melinda SMALE</i> (lxvi): <u>Using a Choice Experiment to Value Agricultural Biodiversity on Hungarian Small Farms: Agri-Environmental Policies in a Transitional Economy</u>
CCMP	49.2004	<i>Gernot KLEPPER and Sonja PETERSON</i> : <u>The EU Emissions Trading Scheme. Allowance Prices, Trade Flows, Competitiveness Effects</u>
GG	50.2004	<i>Scott BARRETT and Michael HOEL</i> : <u>Optimal Disease Eradication</u>
CTN	51.2004	<i>Dinko DIMITROV, Peter BORM, Ruud HENDRICKX and Shao CHIN SUNG</i> : <u>Simple Priorities and Core Stability in Hedonic Games</u>
SIEV	52.2004	<i>Francesco RICCI</i> : <u>Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory</u>
SIEV	53.2004	<i>Anna ALBERINI, Maureen CROPPER, Alan KRUPNICK and Nathalie B. SIMON</i> : <u>Willingness to Pay for Mortality Risk Reductions: Does Latency Matter?</u>
NRM	54.2004	<i>Ingo BRÄUER and Rainer MARGGRAF</i> (lxvi): <u>Valuation of Ecosystem Services Provided by Biodiversity Conservation: An Integrated Hydrological and Economic Model to Value the Enhanced Nitrogen Retention in Renaturated Streams</u>
NRM	55.2004	<i>Timo GOESCHL and Tun LIN</i> (lxvi): <u>Biodiversity Conservation on Private Lands: Information Problems and Regulatory Choices</u>
NRM	56.2004	<i>Tom DEDEURWAERDERE</i> (lxvi): <u>Bioprospection: From the Economics of Contracts to Reflexive Governance</u>
CCMP	57.2004	<i>Katrin REHDANZ and David MADDISON</i> : <u>The Amenity Value of Climate to German Households</u>
CCMP	58.2004	<i>Koen SMEKENS and Bob VAN DER ZWAAN</i> : <u>Environmental Externalities of Geological Carbon Sequestration Effects on Energy Scenarios</u>
NRM	59.2004	<i>Valentina BOSETTI, Mariaester CASSINELLI and Alessandro LANZA</i> (lxvii): <u>Using Data Envelopment Analysis to Evaluate Environmentally Conscious Tourism Management</u>
NRM	60.2004	<i>Timo GOESCHL and Danilo CAMARGO IGLIORI</i> (lxvi): <u>Property Rights Conservation and Development: An Analysis of Extractive Reserves in the Brazilian Amazon</u>
CCMP	61.2004	<i>Barbara BUCHNER and Carlo CARRARO</i> : <u>Economic and Environmental Effectiveness of a Technology-based Climate Protocol</u>
NRM	62.2004	<i>Elissaios POPYRAKIS and Reyer GERLAGH</i> : <u>Resource-Abundance and Economic Growth in the U.S.</u>
NRM	63.2004	<i>Györgyi BELA, Györgyi PATAKI, Melinda SMALE and Mariann HAJDÚ</i> (lxvi): <u>Conserving Crop Genetic Resources on Smallholder Farms in Hungary: Institutional Analysis</u>
NRM	64.2004	<i>E.C.M. RUIJGROK and E.E.M. NILLESEN</i> (lxvi): <u>The Socio-Economic Value of Natural Riverbanks in the Netherlands</u>
NRM	65.2004	<i>E.C.M. RUIJGROK</i> (lxvi): <u>Reducing Acidification: The Benefits of Increased Nature Quality. Investigating the Possibilities of the Contingent Valuation Method</u>
ETA	66.2004	<i>Giannis VARDAS and Anastasios XEPAPADEAS</i> : <u>Uncertainty Aversion, Robust Control and Asset Holdings</u>
GG	67.2004	<i>Anastasios XEPAPADEAS and Constadina PASSA</i> : <u>Participation in and Compliance with Public Voluntary Environmental Programs: An Evolutionary Approach</u>
GG	68.2004	<i>Michael FINUS</i> : <u>Modesty Pays: Sometimes!</u>
NRM	69.2004	<i>Trond BJØRNDAL and Ana BRASÃO</i> : <u>The Northern Atlantic Bluefin Tuna Fisheries: Management and Policy Implications</u>
CTN	70.2004	<i>Alejandro CAPARRÓS, Abdelhakim HAMMOUDI and Tarik TAZDAÏT</i> : <u>On Coalition Formation with Heterogeneous Agents</u>
IEM	71.2004	<i>Massimo GIOVANNINI, Margherita GRASSO, Alessandro LANZA and Matteo MANERA</i> : <u>Conditional Correlations in the Returns on Oil Companies Stock Prices and Their Determinants</u>
IEM	72.2004	<i>Alessandro LANZA, Matteo MANERA and Michael MCALEER</i> : <u>Modelling Dynamic Conditional Correlations in WTI Oil Forward and Futures Returns</u>
SIEV	73.2004	<i>Margarita GENIUS and Elisabetta STRAZZERA</i> : <u>The Copula Approach to Sample Selection Modelling: An Application to the Recreational Value of Forests</u>
CCMP	74.2004	<i>Rob DELLINK and Ekko van IERLAND</i> : <u>Pollution Abatement in the Netherlands: A Dynamic Applied General Equilibrium Assessment</u>
ETA	75.2004	<i>Rosella LEVAGGI and Michele MORETTO</i> : <u>Investment in Hospital Care Technology under Different Purchasing Rules: A Real Option Approach</u>
CTN	76.2004	<i>Salvador BARBERA and Matthew O. JACKSON</i> (lxx): <u>On the Weights of Nations: Assigning Voting Weights in a Heterogeneous Union</u>
CTN	77.2004	<i>Àlex ARENAS, Antonio CABRALES, Albert DÍAZ-GUILERA, Roger GUIMERA and Fernando VEGA-REDONDO</i> (lxx): <u>Optimal Information Transmission in Organizations: Search and Congestion</u>
CTN	78.2004	<i>Francis BLOCH and Armando GOMES</i> (lxx): <u>Contracting with Externalities and Outside Options</u>

CTN	79.2004	<i>Rabah AMIR, Effrosyni DIAMANTOUDI and Licun XUE</i> (lxx): <u>Merger Performance under Uncertain Efficiency Gains</u>
CTN	80.2004	<i>Francis BLOCH and Matthew O. JACKSON</i> (lxx): <u>The Formation of Networks with Transfers among Players</u>
CTN	81.2004	<i>Daniel DIERMEIER, Hülya ERASLAN and Antonio MERLO</i> (lxx): <u>Bicameralism and Government Formation</u>
CTN	82.2004	<i>Rod GARRATT, James E. PARCO, Cheng-ZHONG QIN and Annon RAPOPORT</i> (lxx): <u>Potential Maximization and Coalition Government Formation</u>
CTN	83.2004	<i>Kfir ELIAZ, Debraj RAY and Ronny RAZIN</i> (lxx): <u>Group Decision-Making in the Shadow of Disagreement</u>
CTN	84.2004	<i>Sanjeev GOYAL, Marco van der LEIJ and José Luis MORAGA-GONZÁLEZ</i> (lxx): <u>Economics: An Emerging Small World?</u>
CTN	85.2004	<i>Edward CARTWRIGHT</i> (lxx): <u>Learning to Play Approximate Nash Equilibria in Games with Many Players</u>
IEM	86.2004	<i>Finn R. FØRSUND and Michael HOEL</i> : <u>Properties of a Non-Competitive Electricity Market Dominated by Hydroelectric Power</u>
KTHC	87.2004	<i>Elissaios PAPYRAKIS and Reyer GERLAGH</i> : <u>Natural Resources, Investment and Long-Term Income</u>
CCMP	88.2004	<i>Marzio GALEOTTI and Claudia KEMFERT</i> : <u>Interactions between Climate and Trade Policies: A Survey</u>
IEM	89.2004	<i>A. MARKANDYA, S. PEDROSO and D. STREIMIKIENE</i> : <u>Energy Efficiency in Transition Economies: Is There Convergence Towards the EU Average?</u>
GG	90.2004	<i>Rolf GOLOMBEK and Michael HOEL</i> : <u>Climate Agreements and Technology Policy</u>
PRA	91.2004	<i>Sergei IZMALKOV</i> (lxx): <u>Multi-Unit Open Ascending Price Efficient Auction</u>
KTHC	92.2004	<i>Gianmarco I.P. OTTAVIANO and Giovanni PERI</i> : <u>Cities and Cultures</u>
KTHC	93.2004	<i>Massimo DEL GATTO</i> : <u>Agglomeration, Integration, and Territorial Authority Scale in a System of Trading Cities. Centralisation versus devolution</u>
CCMP	94.2004	<i>Pierre-André JOUVET, Philippe MICHEL and Gilles ROTILLON</i> : <u>Equilibrium with a Market of Permits</u>
CCMP	95.2004	<i>Bob van der ZWAAN and Reyer GERLAGH</i> : <u>Climate Uncertainty and the Necessity to Transform Global Energy Supply</u>
CCMP	96.2004	<i>Francesco BOSELLO, Marco LAZZARIN, Roberto ROSON and Richard S.J. TOL</i> : <u>Economy-Wide Estimates of the Implications of Climate Change: Sea Level Rise</u>
CTN	97.2004	<i>Gustavo BERGANTIÑOS and Juan J. VIDAL-PUGA</i> : <u>Defining Rules in Cost Spanning Tree Problems Through the Canonical Form</u>
CTN	98.2004	<i>Siddhartha BANDYOPADHYAY and Mandar OAK</i> : <u>Party Formation and Coalitional Bargaining in a Model of Proportional Representation</u>
GG	99.2004	<i>Hans-Peter WEIKARD, Michael FINUS and Juan-Carlos ALTAMIRANO-CABRERA</i> : <u>The Impact of Surplus Sharing on the Stability of International Climate Agreements</u>
SIEV	100.2004	<i>Chiara M. TRAVISI and Peter NIJKAMP</i> : <u>Willingness to Pay for Agricultural Environmental Safety: Evidence from a Survey of Milan, Italy, Residents</u>
SIEV	101.2004	<i>Chiara M. TRAVISI, Raymond J. G. M. FLORAX and Peter NIJKAMP</i> : <u>A Meta-Analysis of the Willingness to Pay for Reductions in Pesticide Risk Exposure</u>
NRM	102.2004	<i>Valentina BOSETTI and David TOMBERLIN</i> : <u>Real Options Analysis of Fishing Fleet Dynamics: A Test</u>
CCMP	103.2004	<i>Alessandra GORIA e Gretel GAMBARELLI</i> : <u>Economic Evaluation of Climate Change Impacts and Adaptability in Italy</u>
PRA	104.2004	<i>Massimo FLORIO and Mara GRASSEN</i> : <u>The Missing Shock: The Macroeconomic Impact of British Privatisation</u>
PRA	105.2004	<i>John BENNETT, Saul ESTRIN, James MAW and Giovanni URGA</i> : <u>Privatisation Methods and Economic Growth in Transition Economies</u>
PRA	106.2004	<i>Kira BÖRNER</i> : <u>The Political Economy of Privatization: Why Do Governments Want Reforms?</u>
PRA	107.2004	<i>Pehr-Johan NORBÄCK and Lars PERSSON</i> : <u>Privatization and Restructuring in Concentrated Markets</u>
SIEV	108.2004	<i>Angela GRANZOTTO, Fabio PRANOVI, Simone LIBRALATO, Patrizia TORRICELLI and Danilo MAINARDI</i> : <u>Comparison between Artisanal Fishery and Manila Clam Harvesting in the Venice Lagoon by Using Ecosystem Indicators: An Ecological Economics Perspective</u>
CTN	109.2004	<i>Somdeb LAHIRI</i> : <u>The Cooperative Theory of Two Sided Matching Problems: A Re-examination of Some Results</u>
NRM	110.2004	<i>Giuseppe DI VITA</i> : <u>Natural Resources Dynamics: Another Look</u>
SIEV	111.2004	<i>Anna ALBERINI, Alistair HUNT and Anil MARKANDYA</i> : <u>Willingness to Pay to Reduce Mortality Risks: Evidence from a Three-Country Contingent Valuation Study</u>
KTHC	112.2004	<i>Valeria PAPPONETTI and Dino PINELLI</i> : <u>Scientific Advice to Public Policy-Making</u>
SIEV	113.2004	<i>Paulo A.L.D. NUNES and Laura ONOFRI</i> : <u>The Profile of a “Warm-Glower”: A Note on Consumer’s Behavior and Public Policy Implications</u>
IEM	114.2004	<i>Patrick CAYRADE</i> : <u>Investments in Gas Pipelines and Liquefied Natural Gas Infrastructure What is the Impact on the Security of Supply?</u>
IEM	115.2004	<i>Valeria COSTANTINI and Francesco GRACCEVA</i> : <u>Oil Security Short- and Long-Term Policies</u>
IEM	116.2004	<i>Valeria COSTANTINI and Francesco GRACCEVA</i> : <u>Social Costs of Energy Disruptions</u>

- (lix) This paper was presented at the ENGIME Workshop on “Mapping Diversity”, Leuven, May 16-17, 2002
- (lx) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications”, organised by the Fondazione Eni Enrico Mattei, Milan, September 26-28, 2002
- (lxi) This paper was presented at the Eighth Meeting of the Coalition Theory Network organised by the GREQAM, Aix-en-Provence, France, January 24-25, 2003
- (lxii) This paper was presented at the ENGIME Workshop on “Communication across Cultures in Multicultural Cities”, The Hague, November 7-8, 2002
- (lxiii) This paper was presented at the ENGIME Workshop on “Social dynamics and conflicts in multicultural cities”, Milan, March 20-21, 2003
- (lxiv) This paper was presented at the International Conference on “Theoretical Topics in Ecological Economics”, organised by the Abdus Salam International Centre for Theoretical Physics - ICTP, the Beijer International Institute of Ecological Economics, and Fondazione Eni Enrico Mattei – FEEM Trieste, February 10-21, 2003
- (lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
- (lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL), Venice, August 28-29, 2003
- (lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003
- (lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003
- (lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003
- (lxx) This paper was presented at the 9th Coalition Theory Workshop on "Collective Decisions and Institutional Design" organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004

2003 SERIES

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

2004 SERIES

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