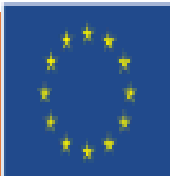




FONDAZIONE ENI
ENRICO MATTEI

Regulation of Air Pollution and Economic Growth in Ukraine: A General Equilibrium Approach

Olga Diukanova



EUROPEAN COMMISSION
7th Framework Programme on
Research, Technological
Development and Demonstration

Marie Curie Actions
International Incoming Scholarships
(IIF)

Content

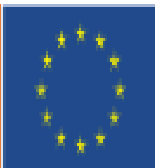
Project Details

Country's Background

Project Objectives

Preliminary results

Relevant researcher' experience



Project details

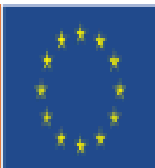
Marie Curie International Incoming Fellowship (IIF- Incoming Phase)

7th Framework Programme

EC Grant Agreement PIIF-GA-2008-220852

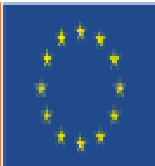
Duration: 24 months

Supervisor: Dr. Francesco Bosello



Ukrainian economy at a glance

- Energy-intensive and resource-based economy that operates outdated industrial infrastructure
- Highly dependent on imported energy: 77% of oil and 72% of gas consumed in the country are imported
- Energy intensity per capita and per GDP (PPP) is one of the highest in the world (IEA)
- Great potential for energy savings and reductions in GHG emissions due to the low energy efficiency (World Bank):
 - 750 M t CO₂-e can be reduced with MAC below \$8/tCO₂-e
 - 1/3 of this emission reduction can be achieved via energy efficiency
 - CO₂ accounts for 78% of all GHG emissions
- 1.35 bln t CO₂-e of “hot air” during 2008-2012



Energy sector and air pollution in Ukraine

Ukraine's energy sector is a major contributor to local and transboundary air pollution:

96% of nitrogen oxides (NO_x)

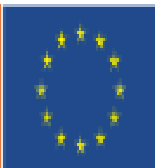
93% of sulfur oxides (SO_x) emissions

65% of the non-metallic volatile organic compounds (NMVOC)

50% of the total suspended particles (TSP)

70% of domestic GHG emissions

Ministry of Environmental Protection of Ukraine (2008). National Inventory of anthropogenic emissions in Ukraine for 1990-2006).



Air pollution in Ukraine: some numbers

The major share of damages inside Ukraine come from TSP followed by NO_x and SO_x

the transboundary damage is dominated by the SO_x-related effects

74% of damage from air pollution occurs inside Ukraine

36% is transboundary

in 2000 damage from NO_x, SO_x, TSP and O₃ emissions cost 14.2 bln. Euros

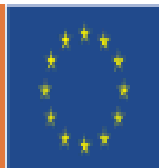
Mortality from these pollutants was estimated as 191,970 years of life lost

World Bank project “Ukraine Energy Sector Review: Environmental Issues” (Droste-Franke, et. al., 2003)

TSP cause 6% of mortality in Ukraine,

the economic damage related to mortality from air pollution exceeds 4% of GDP

Strukova E., Golub A., Markandya A. (2006). Air Pollution Costs in Ukraine/ FEEM. Nota di lavoro 120.2006 (conservative estimates)



Pollution heavens

GHG emissions have never been regulated in Ukraine

State regulation of the criteria air pollutants is highly inadequate and energy-intensive plants are often exempted from pollution charges



Ukraine in post Kyoto period: Ukrainian position

Reduce GHG by 20 % until 2020 and by 50% until 2050 taking 1990 as a baseline year

UNFCCC. Ad hoc working group on further commitments for annex I parties under the Kyoto protocol.- 17th session Bonn, 29 March to 8 April 2009)



70% growth in GHG from the level of 2008 by 2020!!!

But:

Ukrainian production has already slumped down by 36% (April 2009 vs April 2008) which led to further GHG abatement

Prospects regarding the economic recovery are pessimistic

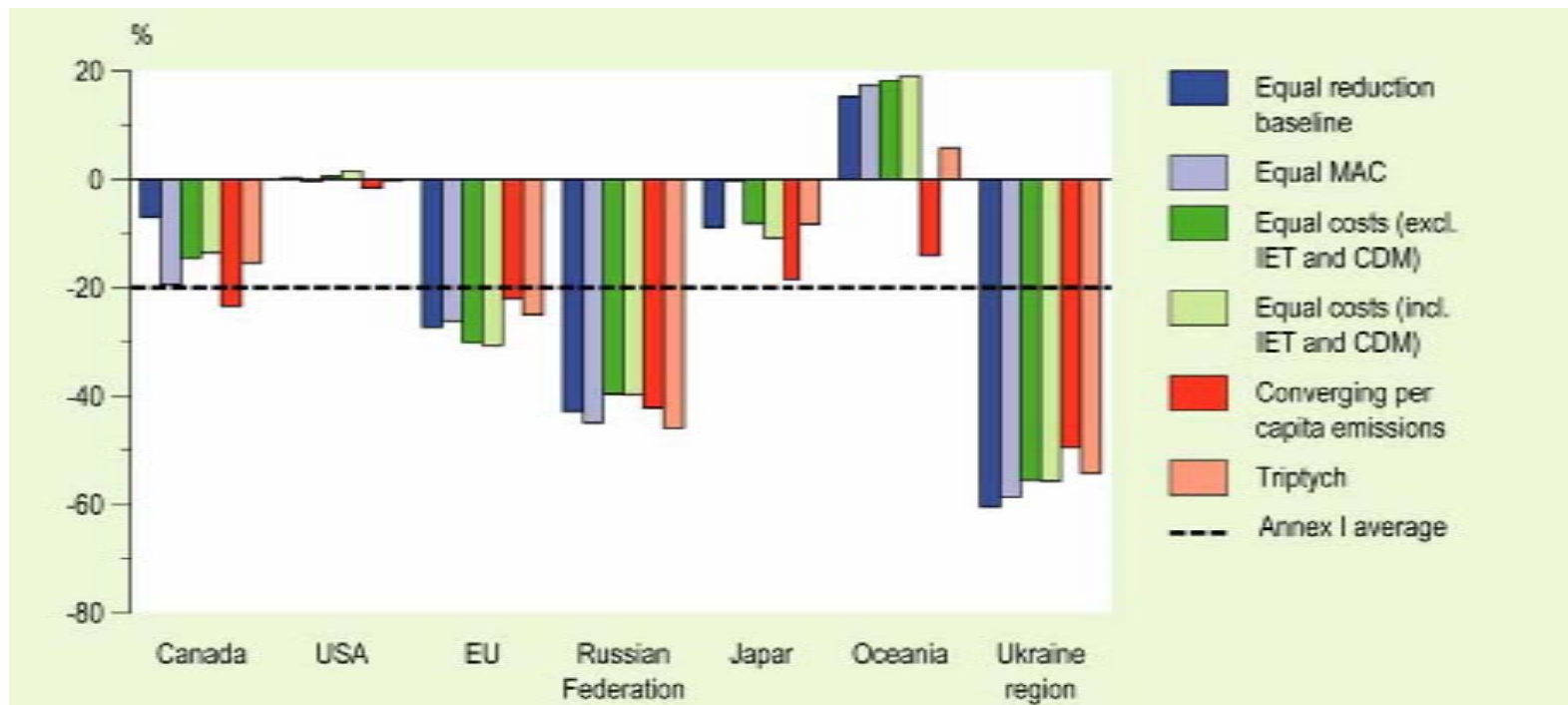
There is huge potential for energy saving and low cost GHG abatement

Ukraine in post Kyoto period: EU position

Ukraine can achieve by 2020 a 55% GHG reduction from the level of 1990 or 10% from the level of 2008

Netherlands Environmental Assessment Agency (2008). Exploring comparable post-2012 reduction efforts for Annex I countries

Reduction Compared to 1990 Levels, Annex I -20%



Research goals

1. Incorporate NO_x, CO, NMVOC, PM_{2.5} and PM₁₀ into the ICES model
2. Evaluate different scenarios of Ukrainian economic development and air pollution
3. Evaluate the domestic measures vs. international collaboration options to regulate Ukrainian air pollution:
 - domestic ETS
 - linkage of Ukrainian and European ETS
 - post-Kyoto targets based on the ongoing negotiations
4. What effect these instruments will have on:
 - levels of air pollution (CO₂, SO_x, NO_x, CO, NMVOC, TSP)
 - mortality/morbidity from air pollution
 - Ukrainian economic performance
5. Develop the policy recommendations

Preliminary results: Ukraine in Post Kyoto. Ukrainian vs. European GHG target (1/6):

Dynamic CGE (GAMS/MPSGE)

Post Kyoto targets: 20% CO₂ reduction by 2020 and 50% by 2050

Baseline year 1990 (Ukrainian target) vs. 2006 (European target)

Instruments: CO₂ tax vs. CO₂ emission trading

No emission reduction until 2012

100% output-based grandfathering in 2013 but amount of auctioned permits is increased each year in order to arrive to 100% auctioning in 2050

O. Diukanova. CO₂ Emission Trading, Air Pollution and Post-Kyoto Policy for Ukraine: A General Equilibrium Approach.- Book Emission Trading and Business (submitted to print, 2009)

Preliminary results: Ukraine in Post Kyoto. Ukrainian GHG target (2/6):

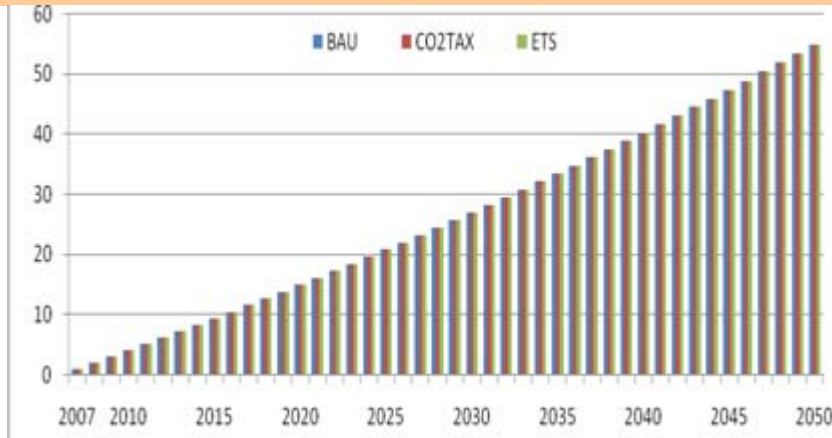
Insights:

No emission reduction occurs if 1990 is taken as a baseline year. Scenarios replicate the baseline

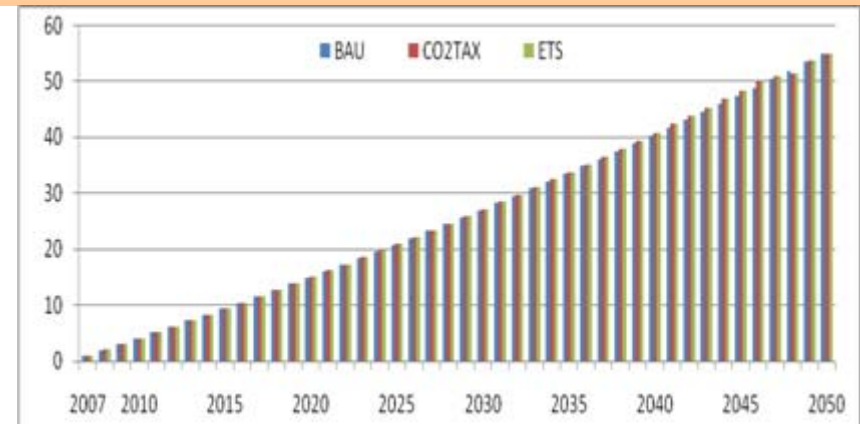
Gain: the unrestrained production growth

Cost: absence of structural changes towards the low energy-intensive industries, further growth in energy consumption, CO₂, SO_x, NO_x and TSP, mortality and morbidity, transboundary air pollution

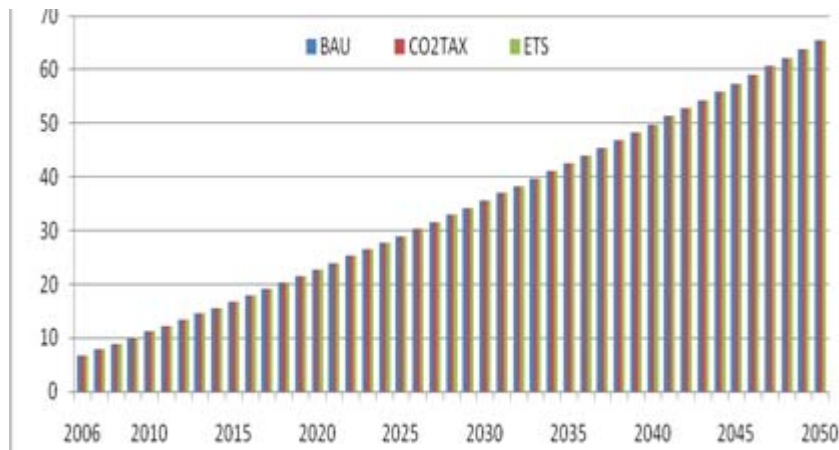
Preliminary results: Ukraine in Post Kyoto. Ukrainian GHG target (3/6):



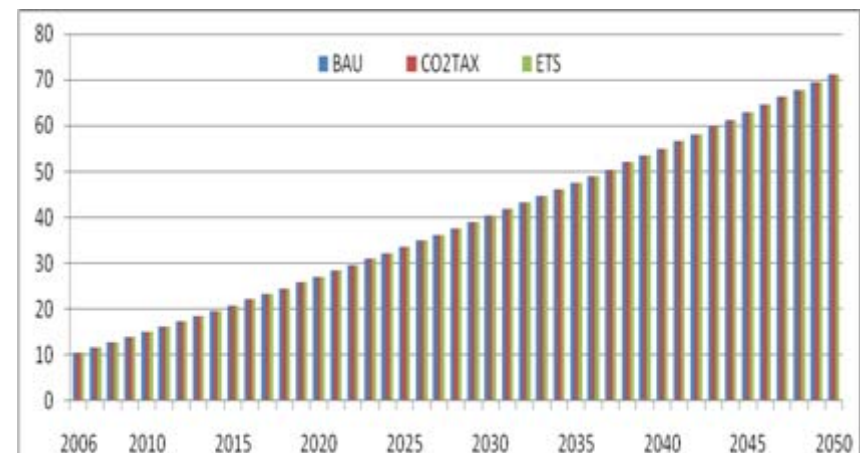
Production, % vs. 2006



Energy consumption in industry, % vs. 2006



Mortality, % vs. 2006



Transboundary pollution, % vs. 2006

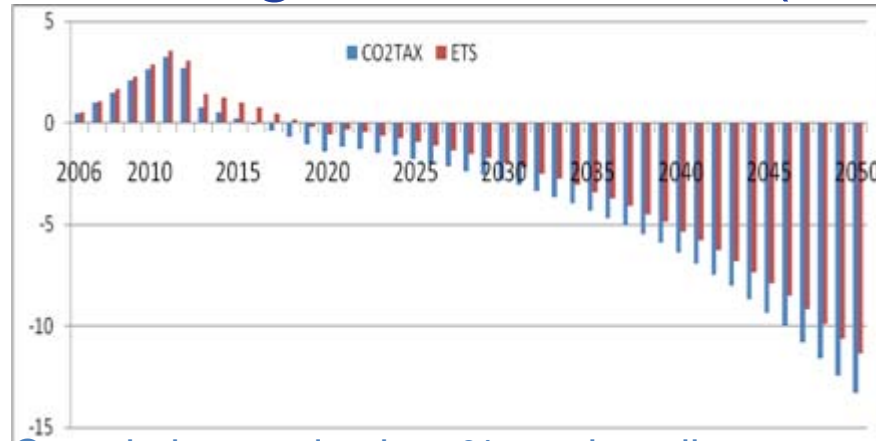
Preliminary results: Ukraine in Post Kyoto. European target for Ukraine (4/6):

Insights:

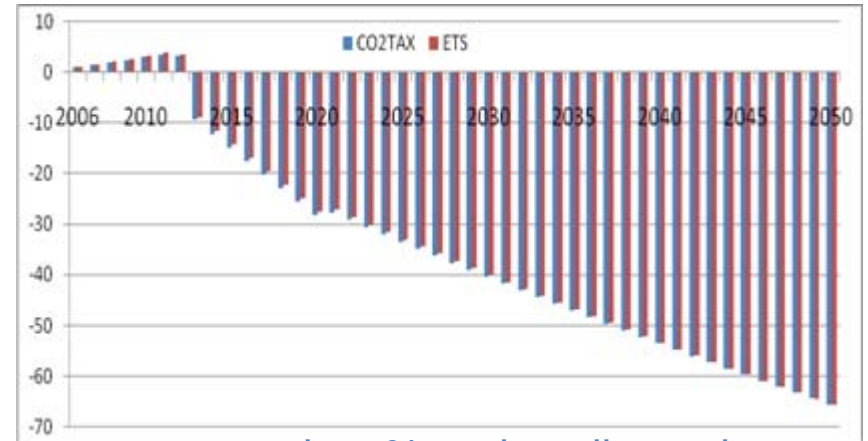
- Gain: structural changes in favour of the low energy intensive sectors, decrease of energy consumption, reduction in CO₂, SO_x, NO_x and TSP, mortality, morbidity from air pollution and transboundary air pollution
- Cost: although cumulative production does not fall down much, the output of the most energy-intensive sectors does



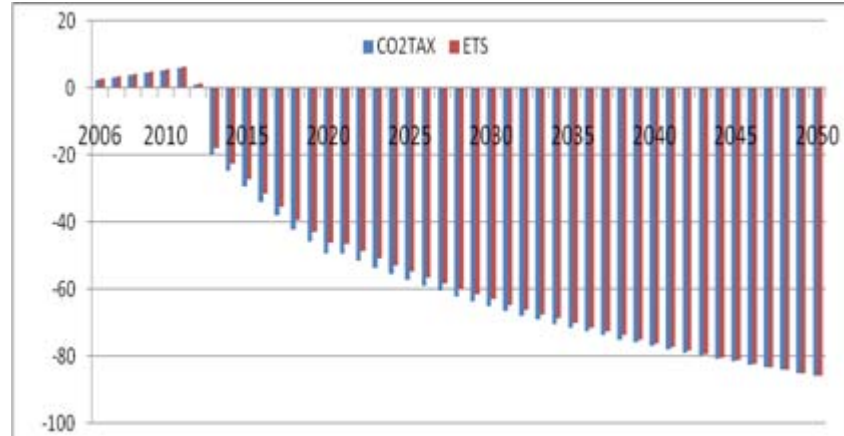
Preliminary results: Ukraine in Post Kyoto. European GHG target for Ukraine (5/6):



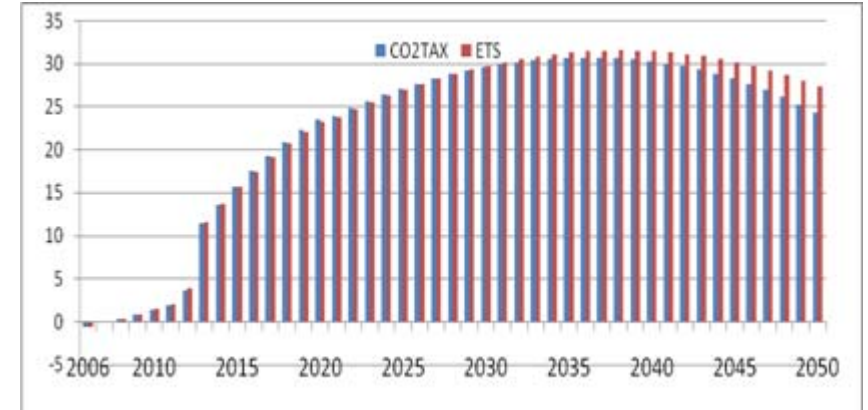
Cumulative production, % vs. baseline trajectory



Energy consumption, % vs. baseline trajectory

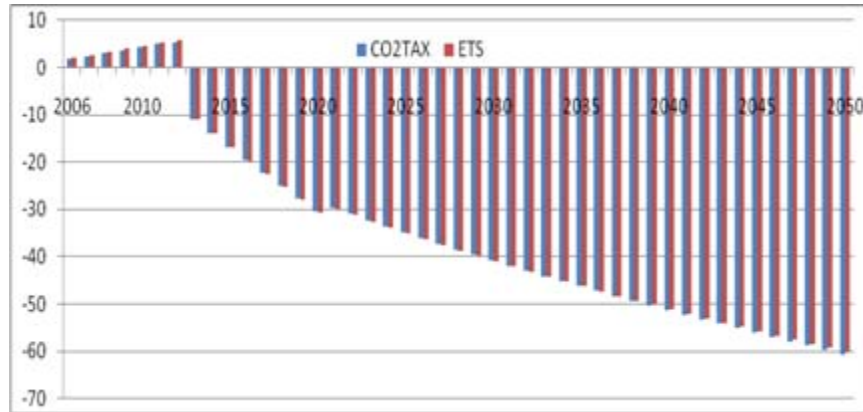


Energy intensive production, % vs. baseline trajectory

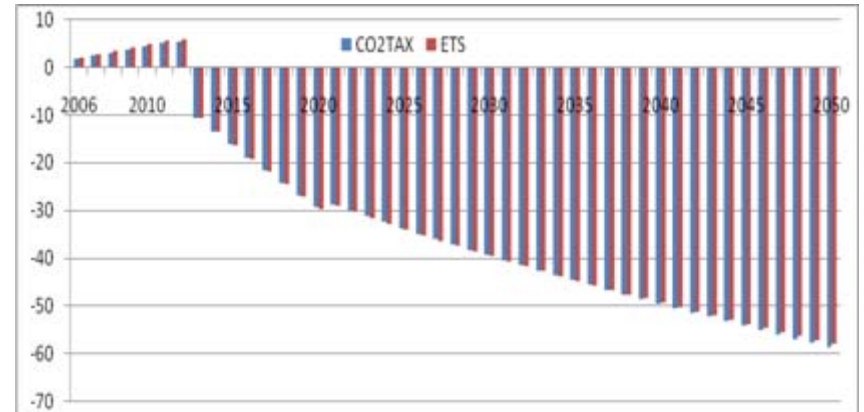


Non energy intensive production, % vs. baseline trajectory

Preliminary results: Ukraine in Post Kyoto. European GHG target for Ukraine (6/6):



Mortality, % vs. baseline trajectory



Transboundary pollution, % vs. baseline

Ukrainian vs. European GHG targets: which one fits more the priorities of Ukrainian economic development?

Reduce TSP by 85.5% by 2030

Reduce NOx by 30.5% by 2030

Reduce SOx by 70%, by 2030

But...Increase fuel consumption by 85.9% (nuclear, coal and renewables)

Structural changes towards the energy intensive production with high share of value added

Implement strict environmental requirements

Decrease energy intensity of GDP

Energy Strategy of Ukraine till 2030 (Ministry of Fuel and Energy of Ukraine), Strategic Challenges for Ukraine in 21 century (NAS of Ukraine)

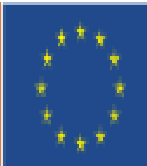
1. Economic effect from the domestic CO2 emission trading in Ukraine (GAMS/MPSGE), Ph.D. thesis
Static CGE. CO2 tax vs. emission trading. Output based vs. emission based grandfathering vs. auctioning.
Closed vs. open domestic ETS
2. Evaluation of possible design options for New Zealand ETS (2008), (GAMS/MPSGE).
Static CGE. ETS design replicates the planned by the NZ government (its all about the cost pass-through). N2O, CH4 and CO2 emissions

Thank you!

Questions? Suggestions?

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