A Unilateral Clean Development Mechanism Scheme for a Developing Country: A General Equilibrium Analysis

Govinda R. Timilsina
Senior Research Economist, The World Bank
Washington, DC

Ram M. Shrestha
Professor, Asian Institute of Technology
Bangkok, Thailand

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PRESENTATION OUTLINE

- Introduction (Background/Motivation)
- Methodological Framework (the CGE Model)
- Main Results
- Discussions
BACKGROUND

- CDM projects implemented by one or more Non-Annex I Parties without involving Annex I Parties are known as unilateral CDM projects;

- Registration of UCDM are allowed since the 18th meeting of CDM Executive Board in February 2005;

- The CDMEB has recently developed modalities and procedures for the registration of a cluster of project under a program of activities, often known as ‘programmatic CDM’.
MOTIVATION

- Developing countries do not seem ready to have mandatory obligations to cut their GHG emissions in the near future;

- An approach to achieve a significant reduction in their GHG emissions could be providing incentives to implement national level policies, such as carbon tax;

- An incentive could be exports of GHG reductions resulted from the carbon tax policy, like CERs in CDM.
OBJECTIVE

- To understand the overall economic impacts of a unilateral CDM scheme where GHG reductions resulted from the introduction of carbon tax in a developing country are exported to industrialized countries (like in CDM);

- To investigate how would the revenue generated through the export of CO$_2$ reductions offset the regressive effects of carbon tax;

- Examine the change in economic impacts of the UCDM along with the schemes for recycling the CDM and carbon tax revenues to the economy.
THE MODEL

- A static, multi-sector, SAM based general equilibrium model for Thailand;

- 21 economic sectors, of which 6 are energy sectors (coal, oil, gas, fuel wood, petroleum refinery, and electricity generation);

- The electricity sector is further divided into seven sub-sectors: hydro; coal-, oil- and gas- fired steam turbine; oil- and gas- fired combined cycle; and diesel fired internal combustion engine;

- Producers’ behavior in all sectors and electricity sub-sectors are represented through four step nested CES production functions;
THE MODEL (cont’d)

- The model considers a representative household that follows a five-step hierarchical optimization process to maximize utility;

- The real government consumption is maintained constant before and after the policy simulation;

- Domestically produced and imported goods are assumed to be imperfect substitutes;

- Walrasian approach was followed to clear the markets.
THE SIMULATED UCDM SCHEME

- A carbon tax of US$40/tCO$_2$

- CDM and carbon tax revenues are recycled to:
  - Households through a lump-sum transfer (Scheme 1)
  - Cutting labor tax rates (Scheme 2)
  - Cutting indirect tax rates of non-energy commodities (Scheme 3)

- CER Price range: 0 to 200 US$/tCO$_2$
The carbon tax is regressive no matter how the tax revenue is recycled.

Supports double dividend hypothesis.

Whether or not UCDM offset the regressive effects of carbon tax depends on (i) scheme of recycling the CER revenue and (ii) the price of CER.
• Emission reductions under UCDM are smaller than in carbon tax alone when the revenue is recycled to cut tax rates; the opposite is found when the revenue is transferred to households.

• Emission reductions decrease with CER price when the revenue is recycled to cut tax rates implying the rebound effects. This is not found when the revenue is transferred to households.
SENSITIVITY ANALYSIS

Values of following elasticity of substitution were changed:

- the primary factor composite and the aggregate intermediate input in sectors other than the electricity sector;
- the capital-fuel composite and the labor-material-electricity composite in the electricity sector;
- the energy aggregate and the material aggregate in the sectors other than the electricity sector;
- capital and fuel in the electricity sector;
- capital and labor in sectors other than the electricity sector;
- present consumption and savings in the household sector;
- labor supply elasticity;
- the energy composite and the material aggregate in the household sector.

The sensitivity analysis indicate that there are no changes in the qualitative results and hence the findings are robust.
CONCLUSIONS

- Supports the double dividend hypothesis;

- Whether or not the UCDM offsets regressive impacts of carbon tax depends on CER price and scheme of recycling tax- and CER-revenue;
  - US$2/tCO2 (cuts in indirect tax rates)
  - > US$55/tCO2 (lump-sum transfer to households or labor tax cuts)
  - welfare increases with CER price under all schemes

- The UCDM causes an increase in trade surplus when the revenue is recycled to households or used to cut labor tax rate. The reverse is found when revenue is used to cut indirect tax rates.

- Emission reductions (CO₂, SO₂ and NOₓ) under the UCDM are higher than that under the carbon tax alone when the revenue is recycled to households as a lump-sum transfer; the opposite is found when the revenue is recycled to cut the tax rates.
THANK YOU

**Contact Address**

Dr. Govinda R Timilsina  
Senior Research Economist  
The World Bank  
1818 H Street, NW, Washington, DC 20433, USA  
Tel: 1 202 473 2767  
Fax: 1 202 522 1151  
e-mail: gtimilsina@worldbank.org