Implementation of an emission trading scheme in Japan: Evaluation of the current propositions

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Overview

In 2008, following to a review of the Kyoto Target Achievement Plan which estimated that Japan will face a shortage 22-36 MtCO2 by 2012, a consensus to implement a mandatory Emission Trading System (ETS) in the Japanese climate policy has emerged. But the implementation of such a policy may impact the Japanese industrial production and lead to carbon leakage. The aim of the present paper is to test different designs of an ETS and to evaluate the efficiency of different options to limit carbon leakage (free allocation, border adjustment).

The Model

CASE-ASIA follows the logic of CASE II developed to represent the Emission Trading System (EU ETS) implemented in EU since 2005 (Monjon and Quirion, 2011a). CASE-ASIA is a static and partial equilibrium model, which represents four sectors: cement, steel, refined petroleum products and electricity. The model comprises of two regions: Japan and the Rest of the World (RoW). Sectors all have a potentially large cost impact of carbon pricing but will face different direct and indirect emissions costs as well as different cost structures (Asuka et al., 2009).

The model aims to evaluate the impact of different designs for an ETS in 2020 with respect to: production levels, price levels and trade flows in each industry. The model also allows for the calculation of the leakage-to-(emissions) reduction ratio for each sector and for the whole ETS.

When carbon pricing policy is carried out in Japan, domestic firms incur three types of additional costs: abatement cost, purchase of allowances and the increase in electricity price.

The method

Based on the Executive Summary released by the Advisory Committee on the Emissions Trading Scheme (2008), several designs of the ETS and several allocation modes are examined.

The Different Designs

The Japanese government envisages implementing an ETS not targeting the electricity sector, which would pay a CO_2-tax. This would be an important difference with the EU ETS. Consequently, the scenarios will envisage two designs:

- **Design 1:** An ETS covering only the cement, steel and refined petroleum products. A CO_2 tax is applied to the electricity sector.
- **Design 2:** An ETS covering the industrial and electricity sectors.

The Allocation Mode

The scenarios considered do not cover all the possible allocation modes but focus on some representative configurations including specific treatment of the sectors exposed to the carbon leakage risk (free allocation, border adjustment). A scenario in which all the allowances are auctioned is examined as well. Each allocation mode is examined under both the designs.

- ***Auction*** features full auctioning of allowances or CO_2 tax in the electricity sector. In the other sectors, there is full auctioning of allowances, without rebating the auction revenues to the firms covered by the ETS, and without any anti-leakage provision.
- ***BA_full*** features full auctioning of allowances or CO_2 tax in the electricity sector. In the other sectors, there is 100% auctioning, with border adjustment on the imports and the exports and for direct emissions. The import and export adjustments are proportional to the Japanese average specific emissions (direct emissions). Having said that, a border adjustment must be designed with great care to maximise its compatibility with the World Trade Organization (Monjon and Quirion, 2011b).
- ***BA_imports*** features full auctioning of allowances or CO_2 tax in the electricity sector. In the other sectors, there is 100% auctioning with border adjustment only on the imports and for direct emissions. The import adjustment is proportional to the Japanese average specific emissions (direct emissions).
- ***OBA*** features full auctioning of allowances or CO_2 tax in the electricity sector. In the other sectors, there is free output-based allocation in exposed industries (cement, steel and refined petroleum products) for direct emissions. The amount auctioned is 83.3% of the electricity sector emissions in 2005 when included in the ETS. In every other sector, the amount of allowances allocated per unit produced is calculated by applying a reduction ratio to the 2005 specific emissions. The reduction ratio is equal across sectors and calculated so that the emission cap is 83.3% of 2005 emissions.

We analyze eight climate policy scenarios and compare them to a no-policy scenario, which is simulated for 2020 without climate policy. This scenario is based on a growing Gross Domestic Product (GDP) and changing technical coefficients (specific emissions, specific electricity consumption). Other exogenous variables stay constant (in particular production costs).

The Results

The inclusion or the exclusion of the electricity sector in the ETS is a crucial element of the climate policy. When a CO_2-tax is applied in the electricity sector, its amount will be around USD65-67/tCO_2 to reduce the emissions of the sector of around 18.7%, while the CO_2-allowance price will be between 14 and 30 USD/tCO_2e depending on the allocation mode. Under the design 2, the allowance price is between 40 and 55 USD/tCO_2e, that is between the allowance price and the CO_2 tax under the design 1.

A consequence of the higher allowance price under the design 2 is that the industrial sectors will increase more the price of their products, while the electricity sector pays less by tCO_2e, hence increases less the electricity price. There is then a trade-off between limiting the increase of the electricity price or of the industrial products price.

The results present the public revenues generated by the allowances auctioning and/or by the CO_2-tax, the industrial and electricity prices, the industrial production levels as well as carbon leakage.

References

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