Reducing the costs of Copenhagen climate pledges in the post-Kyoto world : the role of emission trading and revenue recycling

Jun Li [1]

Meriem Hamdi-Cherif [1]

Christophe Cassen[1]

Céline Guivarch[1]

[1] CIRED, 45 bis, avenue de la Belle Gabrielle , 94736 Nogent-sur-Marne Cedex , France
jun.li@centre-cired.fr +33 143947375

Overview

This study aims at evaluating the strategies and underlying macroeconomic impacts of implementing climate policies on both Annex I (EU and US in particular) and emerging countries (the present study is primarily focused on China and India) within a second-best general equilibrium analysis framework. The primary objective is to identify feasible policy options to minimise the costs to fulfilling the Copenhagen pledges from both industrialised and developing countries' perspectives. Importantly, it is shown that procrastination of climate policy will make developing countries worse off due to the loss of economic competitiveness and carbon lock-in in the longer term. The results of quantitative analysis will help facilitate the international community to provide meaningful input in the upcoming global climate regime negotiations and the debate on reconciling equity and efficiency concerns[1].

Method

Several combinations of climate policy variables and parameters were accounted for in the simulations with IMACLIM-R, a hybrid computable general equilibrium (CGE) model which incorporates features of second best economies. Its main specificity is to endogenize transitory adjustments of an economy constrained by the interplay between choices under imperfect foresight and technical systems(Sassi et al., 2010, Waisman et al, 2011). Numerical stimulations were run to assess different assumptions on changes in climate-friendly technologies , OPEC strategies on the global oil market in conjunction with a series of carbon emissions constraints imposed on economy as well as whether the offset (transnational emission permits trading) mechanism is envisaged.

Results and discussion

We can compare different scenarios of GDP growth loss across different regions in the case that no emission trading will be introduced. Importantly, recycling regime turns out to be an important factor to minimise GDP loss. GDP loss in Annex I would be reduced significantly when developing countries such as India and China commit to reducing carbon emissions as pronounced in the Copenhagen pledges. This is not surprising as the negative impact on economic competitiveness of EU would be largely compensated for when other regions participate in climate mitigation actions instead of mitigating alone. Most importantly, the GDP loss in EU would be nearly neutral in the case of global caps aiming at 450 ppm.

The commitment to 450 ppm trajectory would be extremely costly for China whose annual real GDP growth rate may be reduced by as much as nearly 70% around 2035. The most striking point is that tax recycling is an extremely important factor determining the costs to economic growth when climate policies are implemented. Lump sum transfers to reduce pre-existing taxes are arguably preferred to rebates to households as the costs to GDP could be nearly halved. Specifically, the costs in the 450 ppm scenario could be reduced by more than twice by the mid-century with appropriate tax recycling regime in which case ambitious global commitment would be more likely to occur.

[1] Since the Rio conference in 1992, this debate is at the core of the negotiations between developing and developed countries which do not accept to limit their development regarding environmental constraint.

Concluding remarks

Numerical simulations[2] found that in the case that a non-uniform carbon market is to be established, the participation of non Annex I countries in the global climate agreement plays a key role in minimising negative economic impacts at both global and regional levels. Importantly, a carbon tax recycling regime (scheme) would be a critical determinant of the extent of GDP loss; and the tax levels needed to achieve the prescribed emissions trajectories vary considerably. Simulations also show that trading emissions allowances between Annex 1 and non-Annex I countries will unambiguously help lower the negative macroeconomic impacts to achieve the global emissions mitigation target. More specifically, this will generally make Annex I countries better off as their binding emissions reduction constraint would be loosened than when no allowances can be purchased from Non Annex I countries to offset their domestic emissions. However, our simulations also indicate that the participation of non-Annex I countries would entail significant costs to their economic growth. Appropriate burden sharing mechanism have to be put in place in the international climate negotiations for reducing the adverse socioeconomic impacts and take into account the intra-generational equity issues. Our findings are generally consistent with the existing theoretical and applied literature on climate policies despite the second best characteristics.

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[2] As pointed by Moss et al.(2010), the goal of working with model-based scenarios is not to predict the future, but to better understand uncertainty in order to reach decisions that are robust under a wide range of possible futures. In other words, scenarios are representations of different technical, policy and socioeconomic development options confronting the world in the future. Moreover, the numerical simulations allow us to verify empirically and quantitatively the theoretical projection of emissions trading's impact on macroeconomic growth and welfare gains or losses on each side of the participation.