IMPACT OF EMISSION TRADING MARKET LINKAGE ON CARBON PRICE: FINDINGS OF THE GTAP-E MODEL

Mengfei Jiang, University of Edinburgh Business School, Phone: +44(0)7594 500213, Email: s1036494@sms.ed.ac.uk
Xi Liang, University of Edinburgh Business School, Phone: +44(0)131 6515328, Email: Xi. Liang@ed.ac.uk

Overview

In terms of carbon market linkage, all the limited number of existing emission trading markets are so far at a regional or national level or at the level of a single economic group. The prospects for linking carbon markets in developed and developing countries have been widely discussed and are seen as a way to encourage participation by developing countries in a global climate agreement. The potential benefits of linking emissions markets across countries and regions are well recognized. A global market provides more flexibility for parties to archive emissions reductions at the lowest marginal cost across all covered sectors.

Moreover, as the largest emission trading scheme in the world since 2005, the EU ETS maintains ongoing discussions with ETSs in other regions in order to attempt to establish an international emission trading market. China also has indicated that it would consider participating in an international carbon market, if plans to extend pilot programs to the nation level are successful. The impact from linking carbon markets depends in part on the relative quantity of emissions in the two regions, as markets involved have very different emission levels. Consequently, linking the ETS between EU and China is likely to have larger impacts on the carbon price than linkage between other systems.

Benefits from establishing an international ETS are clear, that a global market provides more flexibility for parties to achieve emissions reductions at the lowest marginal cost across all covered sectors. However, carbon market linkage may not only impact the emission permit price, but also impact total emissions and welfare, and such impacts may depend on a region's own situation, for instance, emission level and policy strength of emission reduction in the two regions. For instance, market distortions or trade effects can affect the relative advantages to each country of participation, and emissions trading regimes may alter the way that economic shocks are transmitted through international markets. Therefore, specified studies that account for the nature of commitments and the structure of each participating economy are required to evaluate supra-national climate proposals.

Methods

To access the impact of carbon market linkage, the GTAP-E model is employed. International trade links the various regions: products from one region can be exported to the rest of the world, and imported goods can enter domestic product markets following the Armington assumption.

The first scenario refers to the initial version of the Kyoto Protocol, including the US and China, however multilateral trading of emission is not allowed among these countries. The second scenario allows multilateral trading between these countries, however, China is not included in these countries. The third scenario includes China in the above global emission trading system in scenario 2, in order to compare the impacts of the linkage of Chinese ETS and the global market.

Results

In the first scenario, where the Annex 1 countries, the USA and China have their own emission reduction target and no multilateral trading of emission is allowed, the marginal abatement costs corresponding to these reductions range from $24.1 in the US and $121.91 in Japan. Marginal costs are lower in the US than other regions because the US uses relatively more coal and taxes energy less heavily. In more carbon-efficient countries, such as Japan and Annex 1 countries, the marginal abatement costs are higher. And the abatement cost is $29.97 in China to achieve 40% reduction target.

In terms of the second scenario, where Chinese carbon market is not included in the global carbon trading market and only the Annex 1 countries and the USA need to achieve their reduction target, the marginal cost among those trading countries is $27.62 per ton of carbon. Allowing multilateral trading of emission among these countries shifts

the burden of the reduction away from oil products in the relatively carbon-efficient economies (EU, Japan and the rest of Annex 1 countries) towards coal in the Eastern Europe and Former Soviet Union. This induces a substantial reduction of the marginal abatement costs in the above economies. The abatement costs in Japan decreases from $121.91 to $27.62 per ton of carbon while the costs in RoA1 drops from $126.19 to $27.62.

However, the marginal cost significantly increases to $40.08 if Chinese carbon market is included in the global trading market, which is in the case of scenario 3. Although the abatement costs increase, a strong and robust carbon price could give investors a right price signal on the value of carbon emission, thus incentive the carbon market activity and improve the liquidity.

It is interesting to find out that while emissions are reduced in some countries that are subject to binding constraints, they increase in the other countries, it implies a phenomenon of "carbon leakage", which implies that additional emissions will be emitted in those countries with no binding constraint relative to the emission reduction in countries with binding constraints. For instance, in scenario 1, the emission in the Eastern Europe and Former Soviet Union increases 1.91% while emission in those net energy exporters increases 1.47%. The cause of carbon leakage are multiple and involve competitiveness effects as well as the reactions of the world energy.

The last but not the least, Chinese stakeholders concern that implementing emission trading in China will have a negative impact on the national GDP. In the scenario of enforcing emission trading mechanism separately, the GDP in China decreases 0.88%. However, a linkage between Chinese carbon market and the international carbon market leads to a significant lower decrease in the GDP in China, resulting as 0.04%.

Conclusions

Linking carbon markets is a bottom-up approach to produce a future global carbon market. Price convergence and potential efficiency gain are the main drivers for linking carbon markets, as the linked schemes create a larger pool of compliance instruments and widen the options for carbon mitigation. In addition, a larger carbon market tends to be more liquid and resilient. The decision to link carbon markets entails political compromise and a trade-off between advantages and disadvantages.

Our results indicate that, although the abatement costs increase in Chinese carbon market after the linkage, a strong and robust carbon price could give investors a right price signal on the value of carbon emission, thus incentive the carbon market activity and improve the liquidity. Also, a linkage between Chinese carbon market and the international carbon leads to significant lower decrease in the GDP in China, resulting as 0.04% comparing to it under non-linkage secnario. In addition, allowing multilateral trading of emission among these countries shifts the burden of the reduction away from oil products in the relatively carbon-efficient economies towards coal in the Eastern Europe and Former Soviet Union. This induces a substantial reduction of the marginal abatement costs in the above economies.