Evaluating CDM Distribution Using an International Trade Framework*

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Background

The fast growth of Clean Development Mechanism (CDM) and its positive and negative attributes have been well documented. Recent years have witnessed explosive growth of the CDM. The number of CDM projects for validation and registration has grown exponentially and developing countries (so-called non-Annex I countries) becoming involved in the CDM grew from 8 in 2000 to more than 50 in 2008[1]. As a result, the issuance of the Certified Emission Reductions (CERs), the CDM currency, will total 2.2 billion by the end of Kyoto Protocol's compliance period in 2012[2].

However, from the time it was created, the CDM has been at the center of controversy. The CDM has been criticized by some for creating new credits outside developed (Annex I) countries. Among other criticisms, both host and credit countries have been focused on low-hanging fruit such as destruction of HFC-23, a potent greenhouse gas (GHG), rather than projects that promote long-term economic development for local communities. The CDM also appears to have failed to engage most developing countries, and in particular, least developed countries, in a meaningful way. In addition, there appears to be imbalances in the distribution of CDM projects[3]. In the beginning of the CDM, India accounted for a significant share of projects. Later, China began to dominate the CDM market, and to date, it has hosted more than 50% of all CDM projects in terms of CERs. China, India, Brazil, and Mexico together accounted for between 60% and 80% of all projects in years 2004-2008. Some interesting questions therefore arise. Why are there such differences among host countries? Is such a distribution reasonable? Which factors can be attributed to the differences? If the international community desires changes to the CDM, which policies might it consider putting into place?

CDM in International Trade

In essence, the country-to-country transactions in CDM are similar to global trade. Credit countries (Annex I) purchase emission permits from host countries (non-Annex I). In buying a permit in a host country, a credit country avoids reducing emissions in its own country, which generally would require higher costs. This is a classic example of comparative advantage. In other words, host countries export permits, which are generated by CDM projects in their countries. Credit countries import such permits, which results in them not having to reduce emissions in their own countries.

Gravity theory provides an empirical framework to evaluate factors that may influence the country-to-country transaction. In its simplest form, the gravity equation states that larger countries will likely trade more with each other, and countries that are more similar in relative size also will trade more. The model also places importance on trade cost. If trade cost between two countries is lower, then countries will tend to trade more with each other. Trade cost may be influenced by many factors in host countries such as natural endowment, infrastructure, international business experience, bureaucrat efficiency, and expertise in the good to be traded.

Here, we apply the gravity model to CDM trade and hypothesize that countries with more GHG emissions will be more likely to make use of the CDM mechanism to reduce GHGs. This assumption is supported by empirical observation, as there is a positive correlation between domestic GHG emissions and CDM involvement.

Findings

Using country-to-country CDM trade data in 2007 and the gravity model in international trade, the relationship among CDM trade, domestic emissions

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[1] CDMpipleline http://www.cdmpipeline.org/overview.htm

[2] Karakosta, C., H. Doukas, and J. Psarras, 2009. Directing clean development mechanism towards developing countries' sustainable development priorities. Energy for Sustainable Development. 13, 77-84.

[3] Haya, B., 2007. Failed Mechanism: How the CDM is Subsidizing Hydro Developers and Harming the Kyoto Protocol: International Rivers.

in Annex I countries and non-Annex I countries, and trade cost are investigated using a linear regression model, with the natural log of the permits purchased by each credit country in each host country. Results confirm that domestic GHG emissions of both host and credit countries are the primary factors for CDM project distributions. More domestic emissions in both host and credit countries lead to more CDM trade between them.

The high volume of GHGs in Annex I countries may incentivize those countries to buy offsets from non-Annex I countries, because it would be more cost-effective than reducing their own domestic emissions. Those non-Annex I countries with more GHG emissions may feel the urgency to reduce their carbon footprint or see the opportunity to reduce their GHG emissions by attracting foreign investment. Although cost-effective CDM opportunities likely exist in small countries as well, the high volume GHG emissions in larger countries probably mean lower marginal abatement cost. The positive relationship between domestic GHG emission and CDM projects partly explains why some big developing countries such as China and India have attracted a large number of the CDM projects.

Trade cost plays a pivotal role in CDM trade, too. Host and credit countries tend to trade more CDM permits when the trade cost is small. Many factors influence the trade cost in the CDM. CDM projects may exhibit economies of scale given their large transaction costs, including registration fees and verification fees, and time between project conception and completion. The average fee per CER issued for CDM projects is much lower for large projects than smaller ones. In other words, host countries can reduce their transaction costs as a percentage of total costs expended on a project by increasing the project's size. This situation will continue unless policies are developed to reduce small-scale project trade costs.

The degree to which a developing country is open to international trade also is an important factor in CDM trade. If a developing country is more heavily engaged in international trade, and has more experience in international business, it may be more willing to attract and initiate CDM projects. Having more experience in international trade has the added benefit in that other countries will be more familiar with its business environment, rules, culture and bureaucracy. Each of these factors may facilitate CDM trade. Not surprisingly therefore, host countries that have benefitted most from the CDM are already active players in international business.

Appropriate infrastructure in host countries can reduce trade cost and increase CDM trade. Some CDM projects such as hydropower depend on good infrastructure to be effective. Infrastructure such as a better road and rail network, a high-quality airport, and stable internet access is helpful to facilitate CDM investment and bring down trade cost. Better infrastructure in large developing countries makes these countries (*e.g.* China) particularly attractive destinations for CDM investment. Thus, to the extent it is deemed desirable to facilitate more CDM investment in least developing countries, assistance in infrastructure improvements is one means to do so.

Some other host country factors also may play an important role in reducing CDM trade cost, such as the bureaucrat efficiency and the expertise related to the CDM, although they seem less important than the other considerations already mentioned. A pro-business bureaucrat may facilitate the process of CDM, save valuable time, and reduce trade cost. Trained specialists are also needed for a CDM project to be conducted properly. Technical support and oversees development assistance for developing countries are likely important, too. Lacking expertise in the CDM is one of major impediments to small developing countries making use of CDM to reduce their domestic GHG.

Conclusion

In sum, large developing countries usually have large domestic GHG emissions, favourable natural endowment, rich experience in international business, better infrastructure, higher bureaucrat efficiency, and more expertise in CDM investment, all of which tend to lead to greater CDM investment in those countries. To allocate more CDM to small countries, especially least developed countries, there will need to be multi-dimensional policies that not only subsidize small-scale CDM projects in those countries but also focus on capacity building. Upgrading infrastructure, more international exchange, and technical assistance all can help those countries garner more CDM projects and hence developed country investment.