

Global Impacts of Paris Agreement on the Economy and CO₂ Emissions: Dynamic CGE Approach

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Abstract

The Paris Agreement to limit global warming came into force on November 4, 2016. This agreement is based on the comprehensive national climate action plans known as Intended Nationally Determined Contributions (INDCs) submitted by more than 150 countries and regions. As both energy-exporting and -importing countries have signed up to the Paris Agreement, more advanced and supportive international cooperation will be required for the success of this first global agreement on climate change.

In this paper, we study how the implementation of INDCs of major countries affects global economy and CO₂ emissions given the current power structure. In particular, we analyze the impact of China's carbon policy on outputs, imports, and CO₂ emissions in China's energy sectors. As China is a net energy importer as well as a major global energy producer, studying the impacts of China's carbon restriction will provide useful insights on international cooperation.

We use the GDyn-E model which is a multi-sector, multi-region, recursive dynamic computable general equilibrium (CGE) model developed by Golub (2013). We apply the GDyn-E model to estimate the impacts of China alone peak-out scenario and the Paris Agreement scenario for the period from 2020 to 2030.

Our simulation results show that the impact on China's GDP is slightly positive in the Paris Agreement scenario. This implies that China's INDC is not ambitious than it looks and when compared with that of other countries. Regarding GDP Japan also shows similar behavior. In contrast, GDP is more than 9% below the baseline in Taiwan and Russia.

When measuring the change of Equivalent variation (EV), the implementation of the Paris Agreement exacerbates economic welfare in most countries with restriction targets. Our factorial decomposition of EV suggests that the main cause of deterioration in China is a decrease in income from financial assets.

China's output of coal, gas, and electricity decreases significantly given carbon restriction. On the other hand, China's imports of coal and gas increase. These results are likely to be related to the high degree of carbon intensity and low degree of capital intensity in China's energy sectors. From the exporting countries' side, Oceanian and Indonesian exports of coal to China and Russian export of gas to China increase remarkably.

Finally, despite international capital mobility, the capital share is likely to fall due to implementation of the Paris Agreement. This is related to the fact that electricity most affected by carbon constraints is roughly capital intensive and non-tradable goods.