HOW WILL CHINA'S STRUCTURAL ECONOMIC TRANSITION INTERACT WITH A NATIONAL CARBON MARKET?

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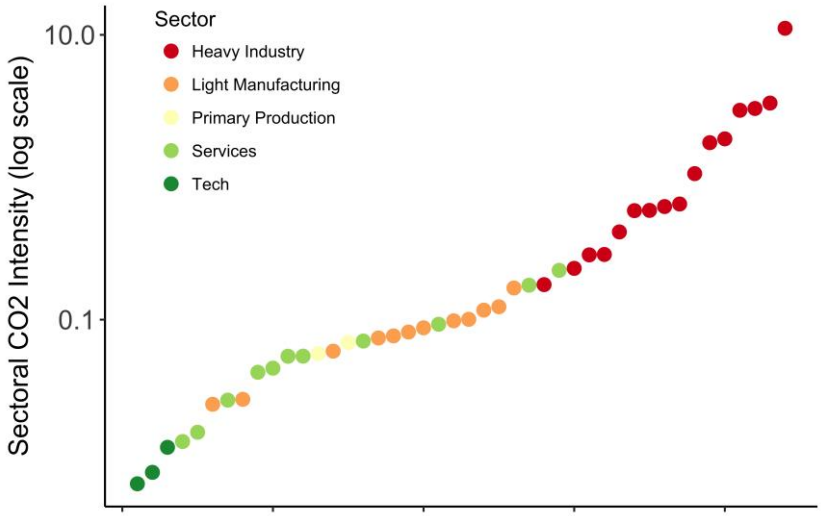
Overview

China exceeds all other countries in annual energy use and greenhouse gas emissions. China's highly concentrated use of fossil fuels, especially coal, has contributed to serious domestic air pollution. In order to promote an efficient, clean energy system, China is developing a nation-wide CO2 emissions trading system (ETS), which will begin sometime before 2020. At the same time, as part of ongoing economic reform, high-level central government policy in China has focused on promoting structural economic transition, which refers to two policy adjustments – the increasing contribution of domestic consumption to GDP over exports, and the shift in industrial structure from heavy industries to services (Qi et al. 2014).

These emissions trading system and structural economic transition policies will both significantly affect China's energy use and intensity. The ETS is meant to increase the price of carbon-intensive fuels in the electric power sector. At the same time, a transition towards the service sector will lead to a lower energy intensity economy-wide, since the service sector is generally less energy-intensive than heavy industry (Figure 1). This paper explores how an economy with a changing structure may interact with a carbon pricing system.

Figure 1: CO2 Intensity (tons CO2/10,000 yuan) of Production in China, 2012 Baseline



Methods

To generate predictions about these policies and their interactions, we use the PRC Aggregated National Development and Assessment (PANDA) model, a global dynamic recursive CGE model that uses data from the Global Trade Analysis Project (GTAP). We model four scenarios: baseline (RF), ETS, structural transition (SR), and ETS + structural transition (ETS+SR).

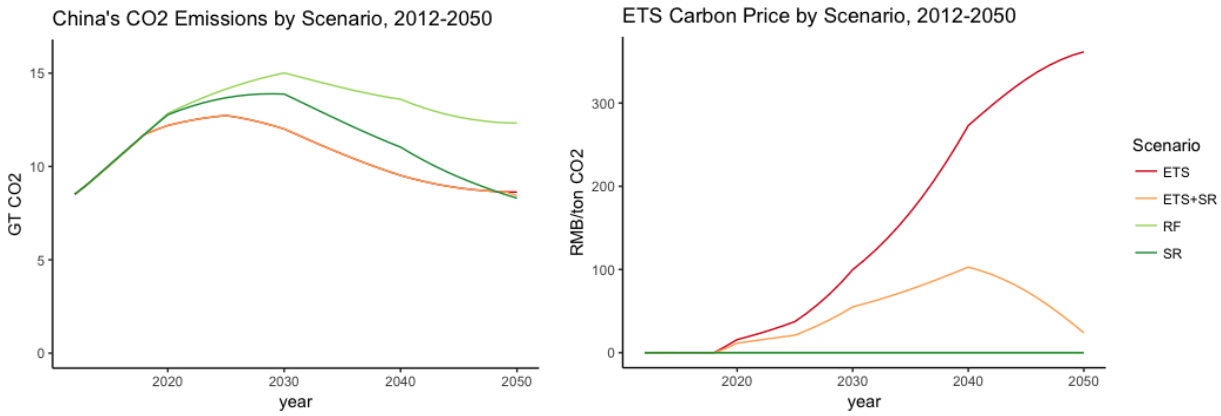
Our baseline is calibrated to data from the Reinventing Fire project (hence the abbreviation RF). The Reinventing Fire technology model was developed by China's Energy Research Institute, the Lawrence Berkeley National Laboratory's China Energy Group, and the Rocky Mountain Institute.

The ETS in PANDA is simulated by making total emissions endogenous and subject to an exogenously imposed cap on emissions (20% reduction in economy-wide emissions below BAU by 2030 and a 30% reduction by 2050). The structural transition in PANDA is simulated by linearly reducing the household savings rate, the corporate savings rate, and foreign investment inflows, and adjusting the export CET share parameter. This is meant to address the common notion that the household savings rate in China is too high, dampening consumption and leading to overinvestment in capital.

Results

GDP: With the savings rate adjustments, the GDP does not grow as much as the BAU or ETS only scenarios. We can see that the ETS scenarios slightly increase GDP due to the boosting effect of the recycled revenue. Thus, the ETS can help mitigate the GDP-dampening effects of structural transition.

Emissions: The ETS and ETS+SR scenarios both reduce emissions the same amount, that is, exactly the amount specified by the emissions cap. The SR scenario alone reduces emissions by a similar amount as the ETS by 2050 due to the shifting structure of the economy away from heavy industry and towards services. These emissions reductions are achieved at a much lower carbon price when the structural transition scenario interacts with the ETS, compared to the ETS alone.



Conclusions

Many studies have analyzed the predicted effects of an emissions trading system policy on macroeconomic variables such as GDP, emissions, and income; however, the inextricable link between emissions and economic structure has been underexplored. The objectives of this project are to use a CGE model to predict the emissions and economic impacts of a national ETS and structural economic transition in China, and to elucidate their potential mechanisms of interaction. China is an important case for analyzing these interactions due to its transitioning economy and its recent decision to implement a national ETS. This research aims to contribute to the growing discussion on how China can make policies that promote both economic transition and environmental protection. Our initial results indicate that an ETS can mitigate the negative effects of structural transition.

References

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