



California and Guangdong: A tale of two cap-and-trade programs

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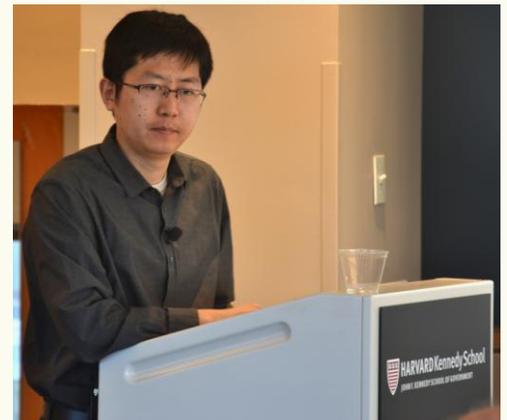
In an intriguing policy coincidence, the province of Guangdong in China and the State of California both implemented cap and trade programs in 2013. In Monday's HKS Energy Policy Seminar, Belfer Center for Science and International Affairs researcher Pu Wang presented his work in progress comparing cap and trade in China's province of Guangdong and the state of California, looking for lessons that China might learn about future steps towards greater use of cap and trade in its carbon mitigation efforts.

Wang began by pointing out the many similarities between California and Guangdong. California is the largest state in the US, in terms of both population and GDP; Guangdong is the largest province in China by those measures. Both entities, Wang said, are known as the "most progressive" in their respective countries. They are the hub of high tech industries, and recognized as leaders in low-carbon policies. Both launched a version of cap and trade in 2013. Both regions, Wang noted, also have many "complementary" policies, such as energy efficiency standards and (in California's case) renewable portfolio standards, low carbon fuel standards, etc., intended to reduce emissions.

Given all these similarities, Wang and his colleagues Cheng-Kuan Lin and Yi-Hua Wu decided that a comparison of the two cap and trade systems, using model simulations to examine how different sectors were affected, might lead to interesting insights about program design.

Wang acknowledged some important differences between the two economies and in the structure of the cap and trade system adopted. In Guangdong, the lion's share (roughly half) of CO₂ emissions are from electricity production and heating, the majority of which are used in manufacturing; in California, the largest share of emissions (44%) is tied to transportation. Guangdong has relatively large heavy industrial sectors, such as steel and cement production, but these sectors are declining as China's economy rebalances, posing a significant challenge for emissions cap setting. In contrast, California's heavy industry sectors are relatively small and stable. Furthermore, California's cap and trade system is somewhat more robust, as it is embedded in legislation, and covers economy-wide greenhouse gas sources. In contrast, Guangdong's system is established by government policy, but not embedded in law, and covers only CO₂ emissions from four industrial sectors. California has an explicit cap which is set to decline over time. In contrast, Guangdong has no single cap—rather, standards for different industries are set administratively on an annual basis.

Wang and his colleagues developed a generalized mixed-effects model and a principle component model to estimate the carbon emissions and carbon intensity before and after implementing cap and trade in both jurisdictions, broken down into discrete industrial sectors. Overall, the analysis showed emissions reductions in many sectors, compared to a projected business as usual scenario. Unsurprisingly, transportation emissions did not seem to be affected (since this sector was not covered during the period reviewed). In some cases, Wang noted, such as the dramatic decrease in emissions in Guangdong's heavy industrial sector, decreases were more likely caused by economic slowdown than by emissions caps (since the decreases were so large that the caps effectively did not apply), illustrating the difficulty of establishing the right level for emissions caps in an economy, such as Guangdong's, subject to large economic fluctuations.



In reflecting on his research, Wang noted that the cap and trade system in Guangdong might, at present, be best understood as a command and control approach with additional flexibility introduced by trading provisions. However, he suggested that, from a policy point of view, such a program should for the present be judged based on what it might develop into in the next ten or twenty years, rather than on its current perfect implementation.

Wang, who is a Giorgio Ruffolo Post-doctoral Research Fellow in Sustainability Science in the Environment and Natural Resources Program of the Belfer Center for Science and International Affairs, spoke as part of the Kennedy School's Energy Policy Seminar Series, which is sponsored by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government.