Lifestyle changes and enhancing energy efficiency in China to contribute to global emission reductions

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According to UN Environment Program (UNEP), a reduction of 12-14 Gt CO2 emissions before 2030 is necessary to achieve the goal of limiting temperature rise below 2°C. As the largest carbon emitter, China plays a key role in fulfilling the global emission reduction target. On the one hand, this requires establishing energy policies to reduce emissions in the production processes. On the other hand, also consumers are expected to contribute by changing their consumption patterns towards products that are produced less emission intensive. This is because (as previous studies have showed) the emission growth due to increasing final demands has out-paced over time the emission reduction due to energy efficiency enhancement. With a high speed of economic growth and improved living standards, China faces a high pressure in particular on reducing emissions through changing final demands. This brings us to the question how lifestyle changes by Chinese households (by following the European consumption pattern rather than the predicted way of living) can contribute to global emission reductions by 2030.

This paper evaluates the emission reduction effects from both the consumer and the producer side. We examine the effects of lifestyle changes and changes in the mix of energy inputs. To this end, we develop an environmentally extended multi-regional input-output model to project emissions until 2030 under different scenarios. The characteristic features of the model are as follows. (1) GDP level in each country during the projection period is endogenously determined by the model, based on input-output analysis. (2) Final demands are estimated on the basis of previous year's GDP. (3) The composition of household consumption by product in each country is obtained from applying the Almost Ideal Demand System (AIDS). (4) The policy effects and ongoing trends in the global market are reflected by making Chinese final demand and intermediate inputs more dependent on domestic suppliers and less on foreign suppliers. (5) The emission coefficients in each industry are based on energy inputs. The structure (or mix) of energy inputs particularly in China follows and extrapolates historical trends.

We apply input-output analysis annually and use this year's projected output to determine next year's final demands. We thus arrive at the emission level in 2030 for the baseline scenario. In the low-carbon lifestyle scenario, we assume that the Chinese household consumption pattern follows the historical pattern of a European country that had the same GDP per capita level in the past as China in 2014. In the accelerated energy efficiency enhancement scenario, the annual decreasing rate of coal use in each industry is assumed to be 1.5 times as in the baseline scenario.