CORRESPONDENCE:

Emission effects of the Chinese–Russian gas deal

To the Editor — In May 2014, Russia and China signed an agreement according to which Russia will supply approximately 38 billion cubic metres of gas to China annually over 30 years via the Power of Siberia pipeline[1]. This additional gas could support the Chinese government's plan to reduce local air pollution and CO_2 emissions by reducing coal consumption.

Dong *et al.*[2] argued that this gas deal between Russia and China would lead to an annual reduction in Chinese CO_2 emissions of 41.7 million tonnes (or 46 million short tons). But this relies on a number of optimistic assumptions about fuel displacement. We show that when potential market responses are considered, the impact of the gas deal on Chinese CO_2 emissions could be less optimistic than expected.

The estimate of Dong *et al.* relies on the assumption that all the additionally imported gas from Russia is used to substitute coal. Indeed, this might be the case if additional gas is used by state-run companies, which are not necessarily exposed to market incentives in the same way as private companies are. In free markets, however, this estimate might be too optimistic as potential market effects are not taken into consideration. This is of particular importance since recent price reforms by the Chinese government aim to liberalize the energy sector in the long term[3], and market effects resulting from the implementation of the gas deal become crucial.

While domestic and imported gas is easily substitutable, energy inputs such as gas, coal and oil tend to be imperfect substitutes in consumption. In addition, China does not face a shortage of gas supplies as the portfolio of gas imports is quite diversified. Thus, more gas from Russia in China's energy market could crowd out more expensive gas imported from other countries and make the overall increase in demand for gas in China less pronounced. Furthermore, the additional gas supply may lower the average energy price in China, inducing additional consumption of energy and related CO_2 emissions.

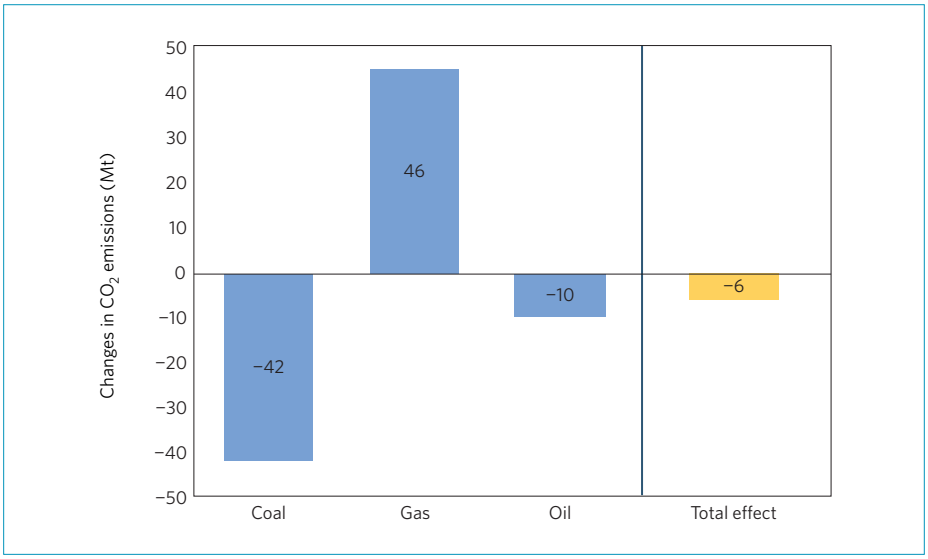

Figure 1 | Average yearly changes of CO_2 emissions in China by energy carrier in millions of tonnes (Mt), induced by the Chinese–Russian gas deal. Calculated in comparison with a business-as-usual-scenario.

Our model shows that total consumption of gas in China could increase by approximately 20 million tonnes of oil equivalent annually, and that CO_2 emissions are only moderately reduced by 6 million tonnes annually, on average (see Fig. 1 and Supplementary Information for details). This suggests that to exploit the full potential of CO_2 emission mitigation, the Chinese–Russian gas deal needs to be complemented by policy measures encouraging substitution from coal towards gas. ❐

References
1. Reuters (21 May 2014); http://go.nature.com/5srqpu
2. Dong, W. *et al. Nature Clim. Change* **4,** 940–942 (2014).
3. Chen, M. *OIES Paper NG 89* (July 2014).

Additional information
Supplementary information is available in the online version of the paper.

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Reply to 'Emission effects of the Chinese-Russian gas deal'

Dong *et al.* reply — Orlov *et al.*[1] suggest that, unless policy changes, economic factors will mean that only a small fraction of Russian gas will be substituted for coal consumption in China as a consequence of a pipeline agreement, contrasting with results from our research[2]. We agree that is so. But policy trends do suggest a drive towards cleaner forms of energy.