



RESEARCH BRIEF

Replacing Coal by Gas: An Effective Strategy to Reduce CO2 Emissions?

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Now more than ever, natural gas is hoped to effectively help shale gas producing regions reduce their CO2 emissions, by largely replacing their coal energy input. At the same time, the domestic replacement of coal by gas releases amounts of tradable coal, whose supply meets the foreign energy demand, contributing to increase emissions in the rest of the world.

As a matter of fact, the ratification of the Paris Climate Agreement by President Obama commits—at least for the next four years—the US Federal Government to significantly reduce its CO2 emissions. To meet this commitment, the plan of the US Administration has been to rely on the rapid development of the gas production from the shale resource in the aftermath of the "fracking" revolution. In the past few years, the rise of gas in the top gas producing country has induced the replacement of the steam coal input in the power generation sector. On the one hand, this replacement has significantly contributed to reduce the US CO2 emissions. On the other hand, it has released large amounts of coal that met the foreign energy demand, contributing to the recent peak in US net exports of coal and, therefore, to CO2 emissions in the rest of the world.

The pressure towards a decrease in US CO2 emissions is likely to persist, irrespective of the ultimate decision of the US Administration whether to be party or not to the Paris agreement. Gas will

continue to be supported, and US coal exports are likely to keep increasing. First, the current US Administration can be expected to give a favorable regulatory treatment to the projects of new coal export terminals. Second, in his June 29, 2017 speech, President Trump announced that the rise in coal exports has become an objective in itself.

In the aftermath of the Paris Climate Agreement, governments will have to rely on unilateral initiatives to meet their respective emission reduction commitments. Besides the US, other gas rich regions consider the strategy of producing more gas to reduce their domestic emissions, such as China, Russia, and the UK. In all such situations, the perspective of increasing coal exports raise the same question as to whether the unilateral strategy of producing more gas to reduce CO2 emissions will ultimately induce world emissions to decrease or not.

In a recent MIT-CEEPR working paper, Daubanes, Henriet and Schubert (2017) point out that the economic analysis of unilateral CO2 reduction

policies and the related carbon leakage is fundamentally modified in presence of more than one carbon energy source. Unlike the standard treatment with a single carbon energy source, they show that an open economy relying on an intermediate—less carbon intensive—energy source like gas to replace the domestic use of the most polluting fuels may ultimately cause a rise in world emissions. The basic difference can be explained as follows: With a single carbon energy source, any carbon penalty—be it unilateral—induces its total supply to contract; by contrast, the promotion of gas contributes to boost the total production of carbon energy sources.

To analyze the option offered by the gas intermediate energy source, Daubanes et al. (2017) examine a stylized open economy. They address the question whether the domestic rise of gas can help reduce domestic and global CO2 emissions. The answer varies not only with the carbon intensities of coal and gas, but also with the demand and supply elasticities and market shares specific to the economy under study. For a given country, the results can be summarized in terms of the rate of pollution increase from gas to coal $(\theta_c - \theta_g)/\theta_g$, where θ_c and θ_g are the carbon intensity of coal and gas respectively. Only when this rate is sufficiently high, as when gas is significantly less CO2 intensive than coal, the domestic carbon penalty does warrant that more gas be produced. Despite the fact that the promotion of gas induces more coal to be exported to the rest of the world, this does not necessarily mean that world emissions are increased. However, for intermediate values of the rate of pollution increase from gas to coal, the domestic policy turns counter-productive, inducing ultimately more CO2 emissions at the world level.

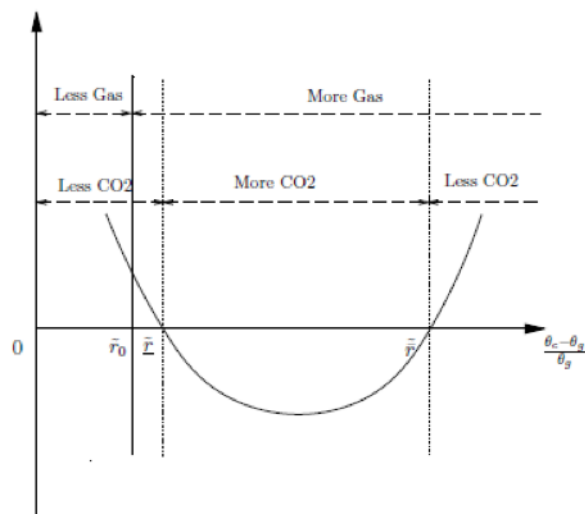


Figure: Domestic CO2 reduction policy, domestic gas boom and world CO2 emissions

In this summary, thresholds depend on the economy's characteristics, calling for country-specific numerical applications of the results. In the case of the US, sensible empirical estimates suggest that producing more gas is justified to reduce domestic emissions, and that this strategy is effective at the world level, despite a high leakage rate. This consolidates the conclusion reached by Wolak (2016) and Knittel et al. (2017) with other methodologies under short-run assumptions on elasticities.

This prediction, however, is highly sensitive to the values of coal and gas supply elasticities; admissible estimates support the case of a more-than-100% leakage rate, making the US policy counter-productive.

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