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ECONOMIC Synopses

A Shutoff of Russian Natural Gas

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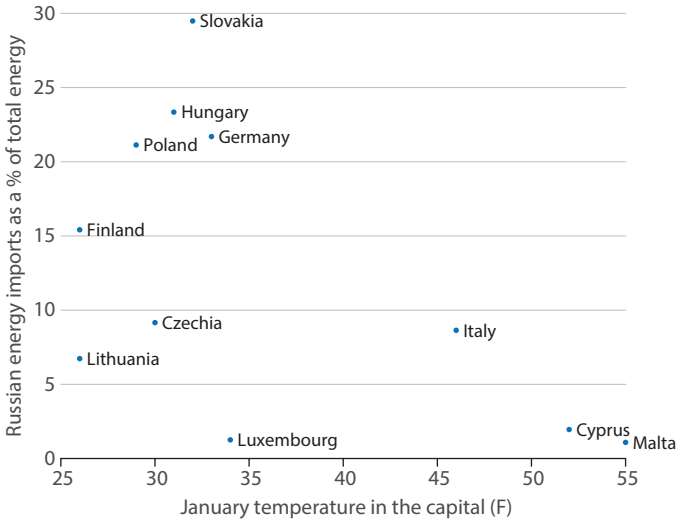
The Russian invasion of Ukraine prompted Western countries to provide additional arms to Ukraine and impose serious sanctions on Russia, including a removal of Russian financial institutions from the SWIFT financial messaging network and bans on Russian seaborne oil exports.[1] In response to these sanctions and threats of an energy price cap or tariffs on Russian oil and gas exports, Russia slowed and sometimes stopped natural gas exports to countries of the European Union (EU) and threatened to end them entirely.[2] Most recently, the Nord Stream 1 and 2 pipelines appear to have been sabotaged, which has shut down the flow of Russian gas to northern Europe.

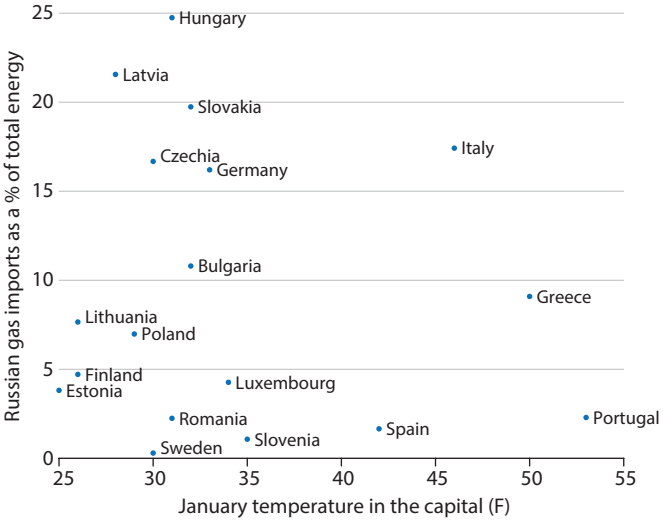
A continued shutdown would be a potentially serious problem, especially during the winter. Natural gas can't be easily replaced with other forms of energy, at least for some years. The most economical way to ship natural gas is through pipelines, as exist from Russia to the EU. To replace natural gas with shipments of liquefied natural gas (LNG), from the United States or other sources, requires specialized container ships and substantial infrastructure to take delivery of the gas through ports and transport it to inland destinations. Such infrastructure ordinarily requires several years to build, although its construction is being rushed.[3] Alternatively, one could replace natural gas with nuclear power; renewable sources such as solar, wind, or hydropower; or coal. But all of these potential replacements have drawbacks, such as greater cost or pollution, and/or would require years to construct.

Presidents Obama and Trump, as well as representatives of Poland and Ukraine, warned of the dangers of this dependence long before the current war. But the EU's reluctance to continue nuclear power or exploit domestic

Dependency on Russian energy vs. average January temperature in capital cities



Dependency on Russian natural gas vs. average January temperature in capital cities



NOTE: The left panel shows a scatterplot of the total energy dependency on Russia versus the average January temperature (in Fahrenheit) in each country's capital, for 27 EU countries. The right panel similarly illustrates the natural gas dependency on Russia versus the average January temperature (in Fahrenheit) in each country's capital.

$$\textit{Energy dependency} = \frac{\textit{Energy imports of Country X from Russia} - \textit{Country X energy exports}}{\textit{Gross available energy in Country X}}. \qquad \textit{Natural gas dependency} = \frac{\textit{Natural gas imports of Country X from Russia} - \textit{Country X natural gas exports}}{\textit{Gross available energy in Country X}}.$$

Because some countries export energy in the form of oil, coal, or electricity, the total energy dependency on Russia can be less than the natural gas dependency ratio. To make the graph more readable, only countries with non-zero-dependency ratios are shown. For the left graph, Austria, Belgium, Bulgaria, Croatia, Denmark, Estonia, France, Greece, Ireland, Latvia, the Netherlands, Portugal, Romania, Slovenia, Spain, and Sweden have zero-dependency ratios. For the right graph, Austria, Belgium, Croatia, Cyprus, Denmark, France, Ireland, Malta, and the Netherlands have zero-dependency ratios.

shale gas reserves left the bloc dependent on Russian oil and gas.

A shutoff of Russian natural gas to Europe will produce heterogenous effects that reflect local winter weather, national dependence on such flows, and policy responses.

This dependence is heterogeneous across countries. It varies with how cold each country gets in the winter, a country's reliance on Russian natural gas exports, and its capacity to store gas. The 2020 data in the figure's two scatterplots provide a very rough estimate of how difficult the winter will be for EU countries. The left panel illustrates the total energy dependency (all imports) from Russia versus the average January temperature in each capital. The right panel similarly shows dependency on Russian natural gas versus January temperatures.

The left panel shows that Slovakia, Hungary, Germany, Poland, and Finland all have cold climates and import considerable energy from Russia. Slovakia imported the most energy (on net) from Russia, a substantial 30 percent; and about 20 percent of its energy supplies came in the difficult-to-substitute form of natural gas (right panel). Hungary, Latvia, Slovakia, Czechia, and Germany imported a large amount of natural gas from Russia and tend to have fairly cold winters.

The EU and its national governments are preparing for the possibility of rationing gas to industry this winter so that households can stay warm, but rationing remains uncertain. Some had believed that the dramatic rise in gas prices would create incentives for consumers and firms to limit their consumption, making rationing unnecessary.

The German government, however, has proposed to pay all private households' gas bills in December and generously subsidize gas bills for both residential and industrial customers for a year or more, starting in early 2023. The generous subsidy is capped at 80 percent of previous consumption for households and small businesses and at 70 percent of previous consumption for industrial firms. The idea behind this subsidy was to have people and firms pay market prices for marginal consumption—thereby encouraging conservation—but to subsidize a lower level of consumption. Other EU members have criticized this move as undermining common EU policy on energy prices.

From an economic point of view, however, the one reason to criticize this proposed subsidy is that—even though it is limited to fractions of past use—it would still change people's and firms' incentives to reduce their consumption of gas. For example, if firms faced market costs for their entire demand for gas—rather than just the portion greater than the subsidized amount—then some firms with gas-intensive production might choose to shut down entirely rather than pay market costs. An alternative that would still assist low-income people but better retain conservation incentives would be to send households subsidy checks with no strings attached while allowing natural gas prices to rise to market levels for all purchases.

The effects of a shutoff or reduction on natural gas flows to Europe will be heterogeneous, as they will depend on local weather and a country's reliance on such flows. ■

Notes

[1] The EU sanctions can be found here, while the U.S. sanctions can be found here.

[2] Russia supplies Europe with a large amount of natural gas through several pipelines, such as Nord Stream 1, Jamal/Yamal, Soyuz/Brotherhood/Transgas, and Blue Stream/South Stream.

[3] Leibovici, Fernando and Dunn, Jason. "Natural Gas Has Become More Tradable! Technological Innovation, Growth, and Perspectives." Federal Reserve Bank of St. Louis (forthcoming in *Economic Synopses*).

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