

How vulnerable are European countries to changes in gas prices?

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On 24 February 2022, the Russian army entered Ukraine, escalating a conflict that had begun almost a decade earlier. On the same day, [the European Council held an urgent meeting](#) to respond to the aggression and to study emergency measures in the face of the foreseeable energy crisis that the conflict would cause.

On the next day, prices for natural gas, of which Russia is one of the world's largest exporters, soared, shaking Europe's energy markets. The following months saw energy saving and supply diversification measures, but also exorbitant bills and fear of shortages.

Two years have passed since then and there are still many unanswered questions. To what extent is Europe vulnerable to fluctuations in the prices of fossil fuels, in particular, gas? And what makes some countries more vulnerable than others? What does all this mean for the energy transition and the EU's commitment to renewables?

Researchers from the University of Barcelona (UB), the Universitat Oberta de Catalunya (UOC), the Universidad de Concepción (Chile) and Queen's University Belfast (United Kingdom) have just published [an article](#) in *Energy Policy* in which they try to answer some of these questions. The study examines European electricity prices' vulnerability to changes in [natural gas prices](#) and proposes new indicators to measure it, which change according to market information and conditions (such as supply and demand or the weather).

What makes an electricity market vulnerable?

One of the main conclusions of the study is that the recent dramatic increases in gas and electricity prices in Europe show how vulnerable its markets are to changes in the price of fossil fuels. This vulnerability is

especially evident when there are substantial variations in energy prices, for example during the energy crisis triggered by the start of the invasion of Ukraine. The article concludes that this highlights the need for more vigilant market surveillance during such episodes, associated with greater market turmoil and volatility.

The study also emphasizes the risks associated with the strong interdependence of the natural gas and electricity markets, particularly during periods of turbulence. When demand for electricity exceeds supply from renewable or nuclear sources, the prices of natural gas become crucial as it is needed to meet demand.

As a result, the volatility of the fossil fuel market is transferred to electricity markets. The researchers conclude that this indicates a need to decouple electricity markets from natural gas prices.

"Vulnerability is a very broad issue, and is even related to energy security. But what we've done in the study is very specific," said Jorge M. Uribe, co-author of the paper, a member of the Faculty of Economics and Business at the UOC and a researcher in the UOC FM2 group.

"In the study, we describe a market as vulnerable when an abrupt change in the price of natural gas leads to an abrupt change in the price of electricity in the local market. According to our study, a market is vulnerable, therefore, when these shocks from fossil fuels are transmitted and intensified in the local electricity market."

To carry out the analysis, the researchers used a very flexible econometric model, enabling them to measure the relationship between natural gas and [electricity prices](#) dynamically. "It's allowed us to study how this relationship changes day by day, according to market conditions," Uribe added.

"It's not the same when prices are low as when they are high. And it's not the same when prices are rising a lot day by day as when they are relatively stable."

Which markets are most vulnerable? The case of Spain

The results of the study highlight the variable nature of the indirect effects of the price of natural gas on the price of electricity over time. In times of stability and regularity they appear to be quite loosely connected, but in times of volatile fossil fuel prices, such as the last two years, relatively significant indirect effects can be observed.

According to the researchers, this suggests a need for continuous monitoring and the establishment of proactive risk management strategies. But which countries are most vulnerable?

The article draws up a kind of ranking, in which it classifies European countries according to the vulnerability of their energy markets in the period analyzed (from 1 January 2015 to 30 December 2022). Italy and the Netherlands are listed as the most vulnerable markets, followed closely by the United Kingdom and Hungary. At the other end of the scale, the Czech Republic and Germany emerge as the markets least vulnerable to fluctuations in natural gas prices, followed by Spain, Portugal and Belgium.

"Spain would be one of the least vulnerable markets, partly due to the measures taken to limit the price of gas in the local market, but also because it has a relatively diversified electricity generation matrix, which allows it to better assimilate the shocks affecting the market, and thanks to the advantages of its geographical position when importing natural gas," explained the UOC researcher.

"On the other hand, the situation of the most vulnerable countries is due to a combination of high dependence on fossil fuels for electricity generation and relatively low levels of market integration."

Natural gas, the green transition and energy poverty

During the first months of the European energy crisis, the impact of the rise in gas prices on the wholesale electricity market led to significant increases in consumer bills. This brought about a rise in energy poverty across the continent, i.e. an increase in the number of households that cannot afford the energy services essential for good health and an acceptable standard of living. This situation is usually the result of a combination of three factors: low income, high energy costs and the inefficient use of energy.

The research introduces innovative indicators to address the second factor in the energy poverty equation. It argues that unexpected spikes in energy prices, which disproportionately affect the energy expenditure of vulnerable households, should be taken into account in strategies to tackle energy poverty.

Despite the progress made in the energy transition, the total elimination of natural gas for electricity generation may not be feasible in the short term, which is why the study recommends considering subsidies and price caps for gas in wholesale markets, while the effects of gas prices on the electricity market in general are carefully evaluated.

"Our results emphasize the importance of greater physical and economic integration of electricity markets, the need for a highly diversified generation matrix that includes greater contributions from renewables, and strategic planning that allows us to exploit the natural advantages southern Europe enjoys for [electricity generation](#) with renewable energies to reduce dependence on actors outside the EU," Jorge M.

Uribe concluded.

More information: Helena Chuliá et al, Vulnerability of European electricity markets: A quantile connectedness approach, *Energy Policy* (2023). [DOI: 10.1016/j.enpol.2023.113862](https://doi.org/10.1016/j.enpol.2023.113862)

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