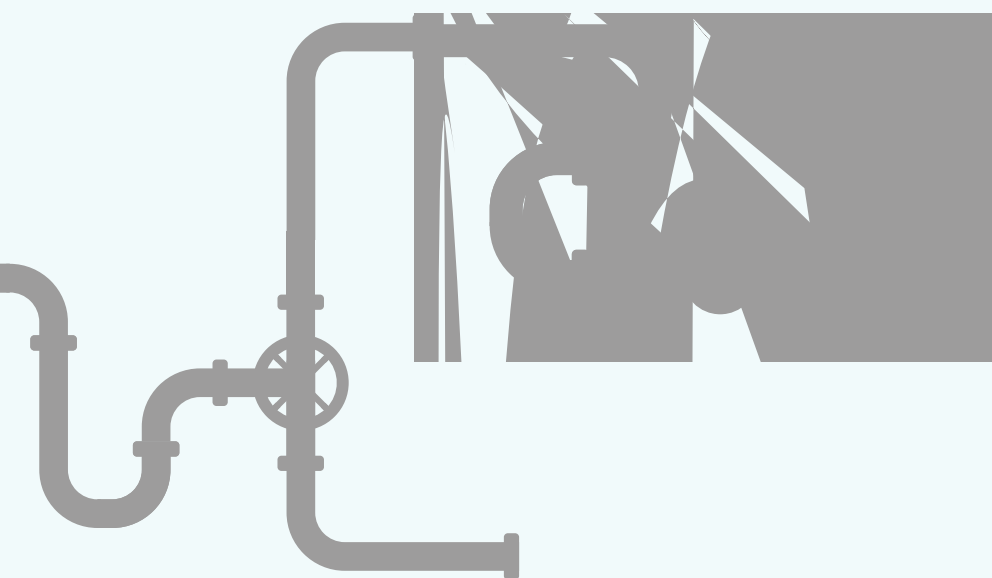


Empirical Basis of Economic Impacts Aggregated energy security (supply diversity)





Multiple Impacts Calculation Tool



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Quantification method



Description

In order to quantify the supplier diversity for energy carrier e , a modified version of the Herfindahl-Hirschman-Index (HHI) is used:

$$HHI_{c,e} = \sum_{p=1}^{N_p} \left(\frac{k_p \cdot IE_{c,e,p}}{IE_{c,e}} \right)^2$$

In this equation, $IE_{c,e}$ represents the amount of caloric value of imported energy carrier e originating from country p , while $IE_{e,tot}$ stands for the total caloric value of the imported energy carrier e . A problem of the HHI is that it does not differentiate between reliable and unreliable partner countries. Therefore, the risk-coefficient k_c is introduced, quantifying the risk of supply disruptions. Since a high HHI is bad, a value of 0.5 is assigned for EU countries, 0.7 for EFTA countries and the UK, and 1 for the rest of the world. At a later stage, a consideration of figures from the World Energy Council's Energy Trilemma, taking particularly the energy security dimension into account. The adapted HHI is normalised to values between 0 (exclusive) and 1, the latter describing a monopoly held by a country that is neither part of the EU nor of the EFTA and the UK. This method can also be used for all energy carriers combined by adding the relevant energy carriers' caloric value for each country:

$$HHI_c = \sum_{p=1}^{N_p} \left(\frac{k_p \cdot \sum_{e=1}^{N_e} IE_{c,e,p}}{IE_c} \right)^2$$

However, an aggregation obfuscates strong dependent relationships for single energy carriers by averaging. A top-down approach is most expedient for this quantification, the data being available from Eurostat.

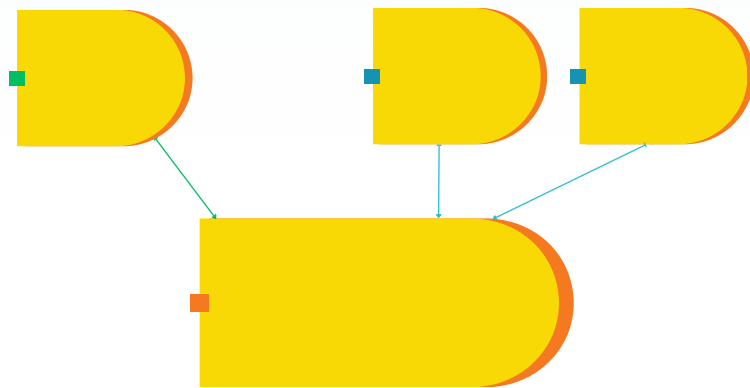


Figure 2: Quantification of the indicator aggregated energy security (supply diversity)

Methodological challenges

The calculation of energy savings' impact on the HHI is rather inaccurate. Firstly, subtracting energy savings from the largest supplier could lead to a change in the supplying order if the difference between the two leading countries is smaller than the saved energy. Secondly, a country could be keen on reducing the quota of a supplier deemed unreliable or with which the political relation is brittle, rather than just reducing the main supplier's share. In order to alleviate these issues, a more complicated equation striving to minimise the overall HHI could prioritise which country's imports to reduce. However, this would lead to a more complex determination process, contradicting the overarching idea of a simple easy-to-use tool.

Data requirements

Independent of sophistication or of whether the energy carriers are aggregated or broken down, the same data is required from Eurostat, namely the "Imports of [energy carrier] by partner country" for each examined energy carrier. The same data would be necessary for the future from PRIMES, which is likely going to be difficult to get.



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