A multi-disciplinary approach to estimate the medium-term impact of COVID-19 on the energy system: a case study for Italy

Themenbereich: (Open-Source) Modellierung

Davide BAZZANA[(1,3)], Jed J. COHEN[(6)], Nicolò GOLINUCCI[(1,2)], Manfred HAFNER[(1)], Michel NOUSSAN[1(1)], Johannes REICHL[(6)], Matteo Vincenzo ROCCO[(2)], Alessandro SCIULLO[(4,5)], Sergio VERGALLI[(1,3)]
[(1)]Fondazione Eni Enrico Mattei, [(2)]Politecnico di Milano, [(3)]Università degli Studi di Brescia, [(4)]IRES Piemonte – Istituto di Ricerche Economico Sociali del Piemonte, [(5)]Università degli Studi di Torino, [(6)]Energieinstitut an der Johannes Kepler Universität Linz

Motivation und zentrale Fragestellung

The effects of the COVID-19 pandemic on the global energy sector in 2020 has caused unprecedented variations in both energy demand and supply. Recent estimates by the International Energy Agency quantify this disruption in a 5% reduction in world energy demand from 2019 and a decrease of 7% in energy related CO2 emissions [1]. The aim of this paper is to estimate potential impacts of different COVID-19 scenarios on the Italian energy sector through 2030. We focus on energy consumption and CO_2 emissions, with additional intermediate results, such as mobility demand, aggregate GDP level and GDP by industrial sector.

Methodische Vorgangsweise

The analysis takes a multi-disciplinary approach to properly consider the complex interactions of sectors across Italy. This approach includes a transport model, a macro-economic model, a meso-economic model and an energy model. The transport model is based on the integration of an econometric assessment and an expert survey to calculate mobility demand and modal share outputs. The macro-economic model has the objective of calculating the future trend of the national GDP by analysing multiple economic indicators, including the deficit and the expected evolution of Italian companies and sectoral activities. The meso-economic model builds on this output to perform a detailed distribution of the GDP in the different industrial activities by considering sectoral interdependencies and users' preferences. Lastly, the energy model incorporates the outputs of the previous models to estimate the energy consumption and the direct CO_2 emissions of the different sectors and sub-sectors by integrating other aspects related to future national policies. The modelling framework has been applied to three different scenarios, a "best-case", a "medium-case" and a "worst-case". Each of these three COVID scenarios represents a shock (of different length) to a baseline scenario, which refers to the expected pre-COVID economy and energy pathway in Italy to 2030.

Ergebnisse und Schlussfolgerungen

The results confirm differences across scenarios and the decrease of energy consumption related to a reduced industrial activity as well as a lower mobility demand. The evolution of direct CO_2 emissions follows the one for energy consumption (Figure 1). In comparison with the baseline, where COVID-19 did not happen, the "Best" scenario shows a 1% reduction, and the "Worst" scenario a 9% reduction in energy consumption in 2030. The effects are stronger in the industry sector, in which the economic crisis causes a persistent decreased energy consumption. In transport, the results suggest a shift away from public motorized transport in favour of private motorized transportation modes. Targeted policies are needed to provide the citizens with viable alternatives that allow for a more sustainable transportation system and lower environmental impacts while guaranteeing equality in access to transport modes.

[1] c.so Magenta 63, 20123 Milano, Italy; +39 02 520 36814; michel.noussan@feem.it; Noussan Michel 1 - People - Fondazione Eni Enrico Mattei (FEEM) (https://www.feem.it/en/people/noussan-michel-1/)

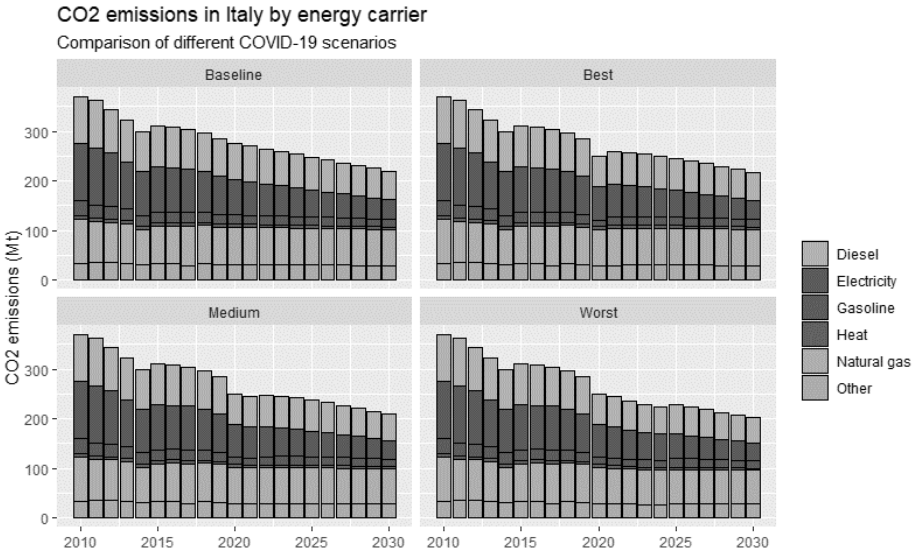

Figure 1: Future CO2 direct emissions in Italy by energy carrier (million tonnes).

We conclude that available resources of the Recovery Fund are to be properly spent within the agreed timelines, which implies a strengthened administrative system and a lighter bureaucracy. Such resources should support innovative technologies, solutions, and industries to build a new economic and energy system which prepares for being competitive in a future decarbonized and digital world.

Literatur

[1] International Energy Agency. World Energy Outlook 2020. 2020;2050: 1–461.