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Editorial: Trade openness, energy usage and environmental quality

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Editorial on the Research Topic
Trade openness, energy usage and environmental quality

As we know, greater openness to trade has become an inexorable trend in an increasingly globalized world. The effects of trade openness on energy use can be both positive and negative. First, openness can help developing economies adopt advanced technology from developed economies, creating technology spillovers that lower energy intensity while increasing output. This is often referred to as the technical effect. It should also be noted that developing countries rely heavily on fossil fuels for energy consumption. As such, lower energy intensity means a cleaner environment for these countries and their neighbors. However, the overall effects of trade could lead to higher energy demands as economies shift from agriculture to industry. Similarly, opening up to trade requires more energy to be supplied to drive the increase in economic activity, which is also likely to increase energy consumption. This implies that energy intensity will be higher and that the environment may become more polluted since fossil fuels are often a significant part of the energy mix. In addition, trading goods heavily rely on fossil fuels which pollute our water and the atmosphere, and thus increasing trade implies heavy impacts on the environment.

The United Nations Climate Change Summit 2021 (COP26) and the WTO's 12th Ministerial Conference offer an opportunity to take the leap that will make trade the engine of climate action. With the right policies, trade can be a powerful force in the transition to net-zero emissions. The United Nations Conference on Trade and Development (UNCTAD) *Trade and Development Report 2021* calls for adapting to climate change. Estimates indicate that the annual cost of climate adaptation in developing countries could reach US$300 billion by 2030 and as much as US$500 billion by 2050 if existing mitigation goals are not reached. However, current funding is less than a quarter of what is estimated to be needed in 2030.

Despite its importance from both academic and policy perspectives, the relationship between trade openness, energy use, and environmental performance has yet to receive all the attention it merits. In this Research Topic, we have gathered five articles that cover global, regional, and national perspectives.

The first article is by Azam et al. from North China Electric Power University (Beijing, China) and coauthors Muhammad Rafiq from the University of Engineering and Technology (Taxila, Pakistan), Muhammad Shafique from City University of Hong Kong (Hong Kong SAR, China), and Jiahai Yuan from North China Electric Power University (Beijing, China). They explore the role of clean energy and technological innovation in cutting carbon emissions in China between 1995 and 2018. Using fully modified least squares and robust least squares, the authors show elasticities of −0.065 and −0.075, respectively, for the relationship between renewable energy and CO2 emissions. Nuclear energy, technological innovation, and enhanced political and institutional quality appeared to reduce CO_2 emissions.

The second article, by Huan Zhang (Nanjing Audit University, Nanjing, China), empirically examines the effects of ICT-based digital trade openness on green total factor productivity (GTFP) for 30 provinces in China between 2002 and 2018. Slack-based model and global Malmquist–Luenberger (SBM–GML) estimation techniques are used to calculate each province's GTFP and explore the heterogeneous influence of digital trade openness on GTFP through scale, technological, and structural effects. The empirical results attained from both the panel fixed model and the panel quantile estimation model suggest similar findings. With the continuous expansion of the scope of digital trade, its scale effect has a significant inhibitory effect on GTFP, whereas the structural effect combined with human capital and the technological effect correlated with technological research and development (R&D) have a significant promoting effect on GTFP. Furthermore, the interaction intensity increases gradually from the low to the high quantile. Robustness tests verify the consistency and stability of the empirical results. Finally, the author provides suggestions for the construction of a high-quality open pattern of digital trade and the coordinated development of GTFP.

The third article, by Pengyu Chen from Dankook University (Yongin, South Korea), applies the dynamic panel model to panel data of listed Chinese firms from 2010 to 2019 to examine the non-linear relationship between internationalization and green innovation performance. The study found a U-shaped relationship between internationalization and green innovation and reveals that the subsidy threshold for internationalization is larger for state-owned, non-coastal enterprises and for enterprises that engage in environmental information disclosure than for other enterprises. Furthermore, state-owned, non-coastal enterprises and enterprises that do not engage in environmental information disclosure are better able to stimulate green innovation output.

The fourth article, by Hu et al. (Hefei University of Technology, Hefei, China; Yuxi Normal University, Yuxi, China) and coauthors from Hefei University of Technology (Hefei, China) and Anhui University of Finance and Economics (Bengbu, China), opens the "black box" of green innovation processes, a critical step in connecting resources and industrial chains. The authors construct a panel model to demonstrate the multidimensional impacts of the global value chain (GVC) position on the green innovation value chain. The mean of green technology R&D efficiency appears to be less than the mean of green achievement transformation efficiency, while the impact of GVC embeddedness on green innovation value chain efficiency is reflected primarily in an increase in the GVC position rather than a deepening of GVC participation.

The fifth article, by Cai et al. (Anhui University of Science and Technology, Huainan, China) and coauthors from Anhui University of Science and Technology (Huainan, China), Huainan Normal University (Huainan, China), Hefei Technology College (Hefei, China), and Tokai University (Hiratsuka, Japan), introduces an improved fuzzy comprehensive evaluation method for rating the quality of coal. The study uses data from the Hostolgoi coalfield in China's Xinjiang province. Six industrial analysis indicators are chosen as evaluation factors by taking coal samples at different seam depths. The results show that, overall, the field's coal enjoys good-quality stability. The evaluation results can improve the efficiency of coal use and provide scientific guidance for evaluating and exploiting coal resources in geologically driven coal exploration.

I want to express my profound gratitude to our distinguished guest editors, contributors, and reviewers for the time and effort that they have put into this Research Topic. I hope you will find reading the articles informative, stimulating, and helpful.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication..

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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