



OPEN ACCESS

EDITED AND REVIEWED BY
Massimiliano Mazzanti,
University of Ferrara, Italy

*CORRESPONDENCE

Svetlana Obydenkova
✉ svetlana.obydenkova@maastrichtuniversity.nl

RECEIVED 01 February 2024
ACCEPTED 02 February 2024
PUBLISHED 15 February 2024

CITATION

Moretti C and Obydenkova S (2024) Editorial:
Mapping pathways towards resilient and
sustainable industrial production.
Front. Environ. Econ. 3:1380471.
doi: 10.3389/frecv.2024.1380471

COPYRIGHT

© 2024 Moretti and Obydenkova. This is an
open-access article distributed under the
terms of the [Creative Commons Attribution
License \(CC BY\)](#). The use, distribution or
reproduction in other forums is permitted,
provided the original author(s) and the
copyright owner(s) are credited and that the
original publication in this journal is cited, in
accordance with accepted academic practice.
No use, distribution or reproduction is
permitted which does not comply with these
terms.

Editorial: Mapping pathways towards resilient and sustainable industrial production

Christian Moretti^{1,2} and Svetlana Obydenkova^{3*}

¹Department of Environmental Systems Science, ETH Zürich, Zürich, Switzerland, ²Laboratory for Energy Systems Analysis, Paul Scherrer Institut, Villigen, Switzerland, ³Aachen-Maastricht Institute for Biobased Materials, Maastricht University, Maastricht, Netherlands

KEYWORDS

environmental policy modeling, environmental economics, industrial transition, sustainable production and consumption, industrial retrofitting

Editorial on the Research Topic

Mapping pathways towards resilient and sustainable industrial production

Introduction

For more than a century, anthropogenic activities have made an unprecedented impact on the planet, contributing to various environmental problems. Among them, the threat of global warming caused by greenhouse gases (GHG) has become evident with the ongoing rise in global temperature. By signing the Paris Agreement, the majority of countries committed to limiting the increase in the global average temperature to below 2°C above pre-industrial levels. However, keeping to the mentioned temperature levels necessitates unprecedented changes in the main economic activities causing GHG emissions. The industrial sector is one of the major contributors to global GHG emissions and is the sector that has shown the fastest growth in GHG emissions over the last two decades.

In this editorial, we explore different critical aspects of the environmental policy modelling challenges applicable to or affecting the promotion of resilient and sustainable industrial production of goods. Each critical aspect is tackled from an environmental economics perspective by combining the contributions of four research articles.

Overarching theme and goals of Research Topic

Given the developing turmoil in the global energy market, oil and gas supply-related issues increase concerns about the capability of the industrial transition to cope effectively with environmental, economic, and social problems. One of the UN Sustainable Development Goals (SDGs) set in the UN Agenda 2030, aiming to ease those concerns, is SDG 9: “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”.

This research topic focused on different aspects of promoting a resilient and sustainable economy from the perspective of environmental economics. In particular, the focus of the four articles within this research topic was mostly related to environmental

policy modelling and touched upon environmental and economic trade-offs of rising by industrial innovation and retrofitting of processes towards circular, lean and clean production processes and supply chains.

Key findings and contribution of each article

The article by [Brumme and Rübberke](#) deep-dived into how effectively addressing global environmental challenges often requires a minimum number of participating countries. Certain international environmental agreements, such as the Paris Agreement, require a specified participation threshold for their activation. In particular, they are the first to explore, through 3×3 normal form games, the potential for successful international cooperation on climate protection when a minimum number of participating countries, showing how sustainable development co-benefits resulting from mitigation efforts may enhance the likelihood of meeting the minimum participation threshold, thereby ensuring the effectiveness of climate policies. For instance, an international policy framework fostering sustainable innovations within a designated “club” of countries could yield a win-win scenario, aligning with both climate and sustainability goals, thereby creating co-benefit spillovers in line with UN Sustainable Development Goal 9.

[Vidal-Meliá et al.](#) examined the impact of market size asymmetry on government decisions regarding environmental policy in the context of bilateral international trade and imperfect competition, with a focus on achieving SDGs related to the environment. Their study models an international duopoly with market size asymmetry and product heterogeneity, where each firm produces two different products for domestic and foreign markets, leading to local emissions. The governments in each country have to choose between emission taxes and production subsidies when planning environmental policies. The key findings of their work highlight the significant role of market size asymmetry in determining the non-cooperative equilibrium policy in a scenario where both firms and governments strategically act. The research indicates that an increase in market size asymmetry between countries tends to push governments toward favoring production subsidies over emission taxes. Consequently, the article suggests that environmental policies need to consider and account for market size asymmetry to enhance the effectiveness of environmental policies.

[Nutakor et al.](#) investigated the relationship between financial development and CO₂ emissions in Ghana from 1960 to 2021, employing the Bootstrap Rolling Window Granger Causality test. Their methodology involved analyzing the impact of financial development on carbon dioxide emissions in sub-samples of the entire period, while also considering feedback from CO₂ emissions to financial development. Their findings indicated that economic development positively influenced CO₂ emissions during specific sample periods where it exhibited Granger causality with CO₂ emissions. Furthermore, significant feedback from CO₂ emissions to financial development was observed, suggesting that without appropriate policy frameworks, financial development may exacerbate CO₂ emissions in Ghana. Therefore, their study

strengthens evidence of the urgent need to implement financial incentives for green investments to expand renewable energy sources and carbon pricing mechanisms, urgently needed to prevent CO₂ emissions from increasing in developing countries.

Lastly, [Gibba and Kamran Khan](#) provided valuable insights into the complex relationship between energy consumption and economic growth in industrialized economies with highly ambitious renewable energy policies like EU member countries. The authors used a panel autoregressive distributed lag (ARDL) model applied to EU member countries from 1990 to 2020 coupled with tests such as cross-sectional dependency, panel unit root, long-run and short-run elasticity, stability, and Granger causality tests. Their findings support a two-way causal link between said factors, with a rise in energy consumption positively influencing short-term and long-term economic growth, and vice versa. This underscores how sustainable energy policies targeting renewables and electrification to decouple the historical link between energy demand and CO₂ emissions can positively impact economic growth. Additionally, urbanization, investment in information technology and communication, environmental technology, and environmental taxes have been found to have significant impacts, both positive and negative, on economic growth and energy consumption in the short and long run, thus highlighting the importance of considering the interdependencies between said factors when developing energy and environmental policies.

Conclusions

Collectively, the insights from these studies emphasize the need for a comprehensive and integrated approach when dealing with economic valuation of innovative environmental policymaking toward greener and more circular economies in line with SDG 9. They underscore the need for targeted international cooperation, consideration of market dynamics, implementation of appropriate policy frameworks, and sustainable energy practices to effectively address global environmental challenges like climate change and promote sustainable development toward resilient and sustainable industrial production of goods.

Author contributions

CM: Conceptualization, Writing—original draft, Writing—review & editing. SO: Conceptualization, Writing—original draft, Writing—review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

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

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated

organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.