

The impact of decarbonization on trade patterns

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Overview

- 1 Context
- 2 Model
- 3 Scenarios
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- 5 Takeaways
- 6 Next steps
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- A **greater number of countries** commit to reach net zero emissions
 - 128 countries have set or are considering a net zero target by 2050
 - Covers 88% of emissions

- How will decarbonization affect international trade?
 - How will the content of exports change?
 - Who will be the winners and losers of a net zero scenario?
 - Will energy producers be able to shift their specialization patterns to more sophisticated sectors?
 - How will comparative advantage in the production of fossil fuels, energy intensive and sophisticated sectors change?

- WTO Global Trade Model
 - Recursive dynamic computable general equilibrium (CGE) model
- For a description of the WTO Global Trade Model, refer to Aguiar et al. (2019).
- Data calibration: GTAP 10 data base, using 2014 as the year of reference.

Model extension: Energy version

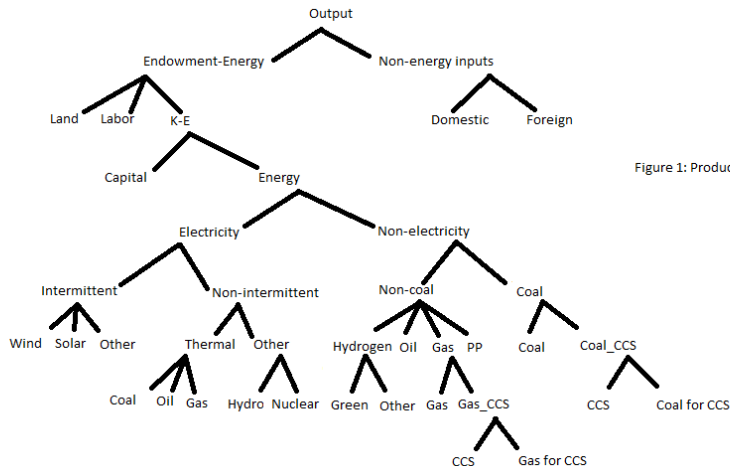


Figure 1: Production structure

Source: Authors

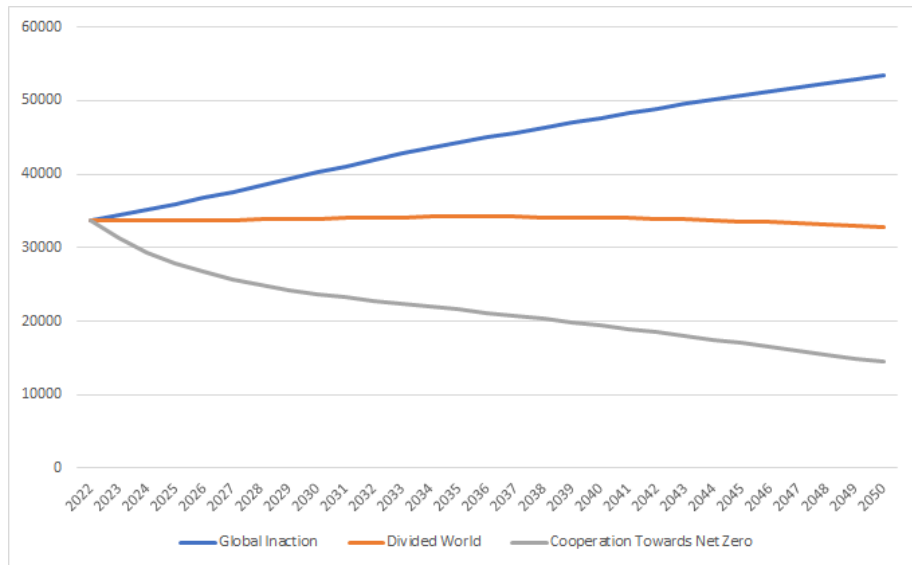
- 3 scenarios:
 - 1 Global inaction
 - 2 Divided world
 - 3 Cooperation towards net zero

- ① **Global inaction:** emissions continue rising with associated global warming. Serves as a benchmark for comparison with the other scenarios.
 - Maintain their global 2021 share in electrical and renewable energy:
 - Global share electricity (2050): 24%
 - Global share renewable energy (2050): 10%
 - Maintain current carbon prices.
 - Do not take further action to comply with NDC commitments.
 - Do not phase out coal.

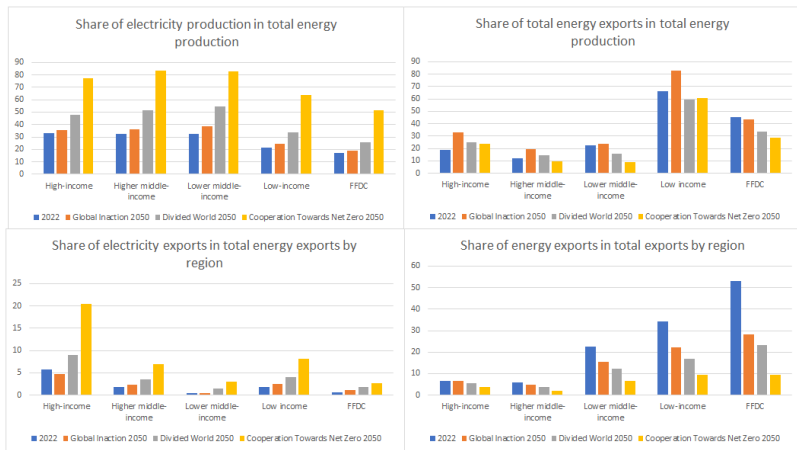
- ② **Divided world:** Countries take unilateral action continuing with fragmented policies.
 - Electrification and renewable shares grow to achieve IEA STEPS.
 - Global share electricity (2050): 26%
 - Global share renewable energy (2050): 60%
 - Carbon prices grow to reach NDC commitments by 2030. Linear growth onward.
 - Coal phase-out achieved by countries who have pledged to do so by 2050.

- ③ **Cooperation towards net zero:** Countries cooperate to tackle the challenges of climate change, leading to:
- Electrification and renewable shares grow to achieve IEA Net Zero:
 - Global share electricity (2050): 49%
 - Global share renewable energy (2050): 88%
 - Global carbon tax: 300 USD per tonne of CO₂ (2050).
 - Global emissions trading.
 - Global phasing out of coal by 2050.

CO2 emissions (in million metric tons)



From global trade in fossil fuels to regional trade in electricity

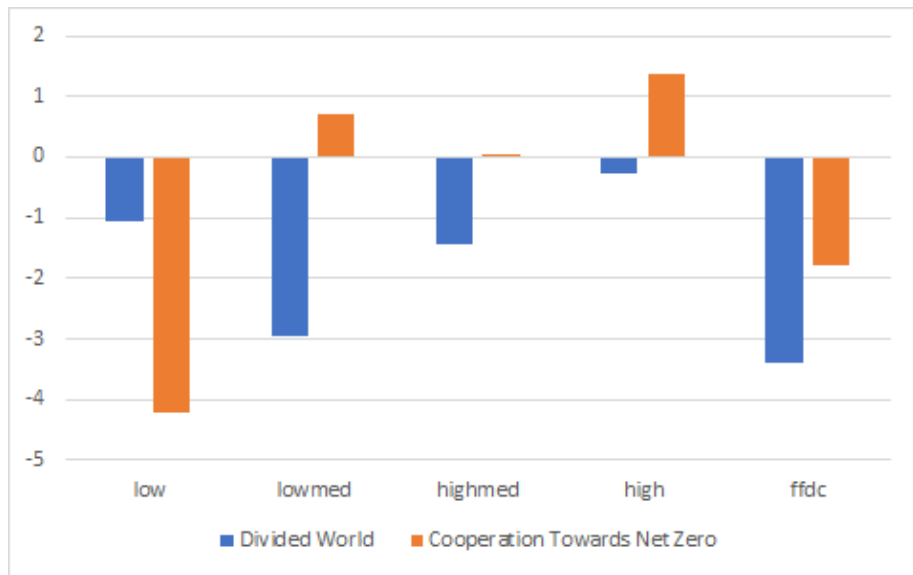


Source: Authors

From global trade in fossil fuels to regional trade in electricity

- Tradability of renewable lower than that of fossil fuels.
- Electrification will lead to a reduction in energy trade.
- Share of electricity production in total energy production rises in all regions.
- Share of energy exported in production falls in most regions, except in high-income regions.
- High income regions tend to trade a larger share of electricity.
- Share of energy exports in total exports falls because of the reduced importance of fossil fuel exports.

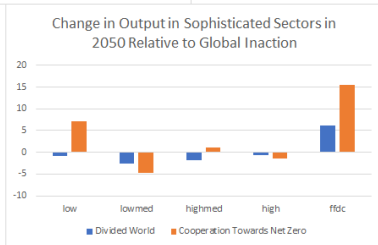
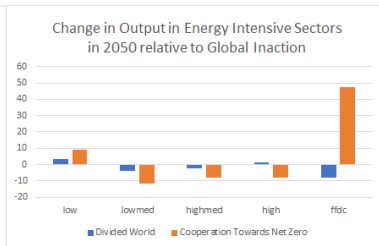
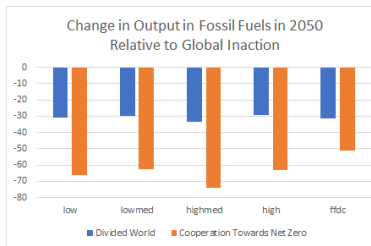
Change in real income relative to global inaction (2050)



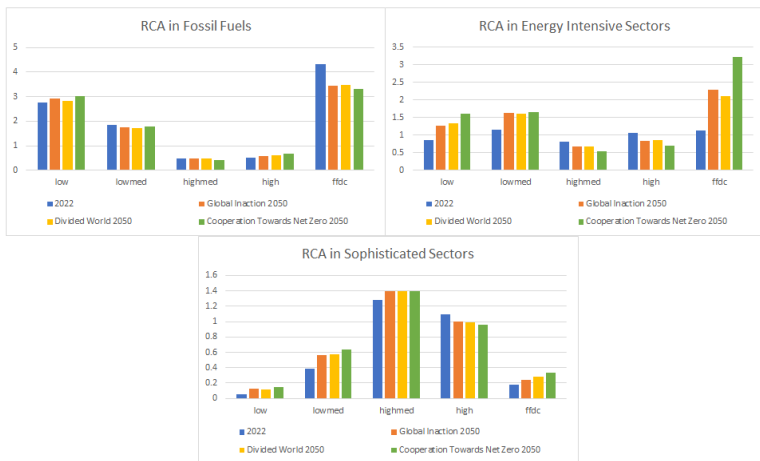
Change in real income relative to global inaction (2050)

- FFDCs face the largest challenges from the decarbonization of the global economy.
- FFDCs are the most exposed to disruptions associated with a transition to a low-carbon economy.
- Decarbonization can help FFDCs in two ways:
 - To shift from the production and exports of fossil fuels to more sophisticated sectors.
 - To shift from production and exports of fossil fuels towards renewable.

Change in real output (fossil fuels, EITEs, sophisticated sectors)



Change in RCA (fossil fuels, EITEs, sophisticated sectors)



Source: Authors

Geographic potential for renewable energy

Average theoretical solar potential,¹
kilowatt-hour per square meter per day

<2.0  >6.4



Mean wind power density of 10% windiest areas at 100m height,²
watt per square meter

<25  >1,300



Source: McKinsey Company (Gupta and Woetzel, 2022) 

- Decarbonization leads to a reduction in energy trade with the shift from fossil fuels to electricity exports which are more localized.
- Some regions may be adversely impacted implying a need for complementary policies to help regions to (i) decarbonize their economies; (ii) cope with the adverse effects of decarbonization; (iii) and shift patterns of specialization.
- Global cooperation is essential.

Next steps

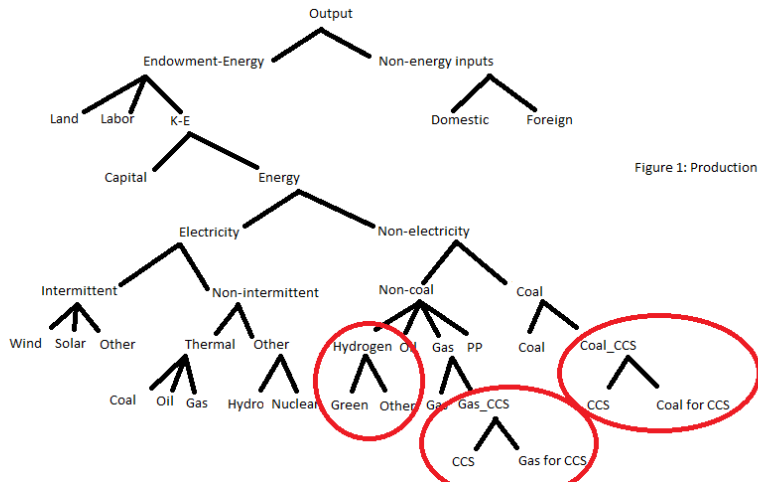


Figure 1: Production structure

Source: Authors

References

Aguiar, A., Corong, van der Mensbrugghe, D., Bekkers, E., Koopman, R.B., Teh, R. (2019). The WTO Global Trade Model: Technical documentation. WTO Staff Working Paper.

Gupta, R. and Woetzel, J. (2022) Asia's net-zero transition: Opportunity and risk amid climate action.

International Energy Agency (IEA) (2021) Net Zero by 2050 - A Roadmap for the Global Energy Sector, Paris: IEA.

McKinsey Global Institute (2022) The Net-Zero Transition: What It Would Cost, What It Could Bring, New York: McKinsey Company.

Peszko, G., Van Der Mensbrugghe, D., Golub, A., Ward, J., Marijs, C., Schopp, A., Rogers, J. and Midgley, A. (2020), Diversification and cooperation in a decarbonizing world: climate strategies for fossil fuel-dependent countries: World Bank Publications

Thomas Hale, Takeshi Kuramochi, John Lang, Zhi Yi Yeo, Steve Smith, Richard Black, Peter Chalkley, Frederic Hans, Nick Hay, Niklas Höhne, Angel Hsu, Camilla Hyslop. Net Zero Tracker. Energy and Climate Intelligence Unit, Data-Driven EnviroLab, NewClimate Institute, Oxford Net Zero. 2022.