Transboundary Climate-Related Risks

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To limit global warming to 1.5°C above pre-industrial levels, the world economy needs to decarbonise rapidly.

- Even if the climate goals were not met, rapid technological change is already underway.

What implications will a phasing out of fossil fuel consumption and a concomitant rise of renewable energy usage have on global trade flows?

- How will this affect international financial flows?
- What will be the transboundary wealth effects?
- What will be the impacts on international macroeconomic interdependencies and the international monetary system?
- What are the data limitations to analyse these effects?
The 25 countries with the largest share in fuel exports/imports as share of total merchandise exports/imports

Note: Compiled with the World Bank’s World Development Indicators, October 2021. Values are for the last available year.
Overview of domestic and international effects of a decarbonisation of the world economy

Domestic economy effects
- Changes in fossil fuel production/consumption
- Changes in renewable energy production/consumption
- Impacts on consumption spending, savings, investment, interest rates, aggregate demand and supply, employment, output
- Financial impacts on domestic equity and portfolio investors, banks and insurers

Transition drivers
- Climate policies
- Technological change
- Change in consumer preferences

Changing patterns of international trade
- Decline of fossil fuel exports and imports
- Growth in trade in renewable energy
- Growth in trade in low-carbon technology/capital goods and critical minerals and intermediate goods required to produce them

International macroeconomic and financial effects
- Wealth effects and financial stability implications from a revaluation of overseas assets
- Impacts on sovereign debt markets
- Impacts on capital flows, exchange rates, global macroeconomic imbalances, international investment positions and the international monetary system
Fossil-fuel and clean-tech importing country
- Decarbonises its economy
- Reduces fossil imports
- Increases imports of clean technology
- Impact on current account and exchange rate depends on changes in fossil fuel and clean-tech imports
- Wealth effects depend on revaluation of domestic assets in fossil-fuel infrastructure and overseas assets in fossil fuels, clean tech and metals

Fossil-fuel exporting country
- International demand for fossil fuels declines
- Fossil fuel price declines
- Reduced investment in fossil fuel extraction
- Asset stranding → negative wealth effects
- Deterioration of current account and devaluation pressure on exchange rate
- Deterioration of international investment position → less investment of petrodollars in international financial centres

Clean tech-exporting country
- International demand for clean tech capital goods increases
- Increase of investment and production of clean tech
- Positive effects on output and employment
- Positive wealth effects
- Improvement of current account and appreciation pressure on exchange rate
- Improvement of international investment position → more investment in international financial centres

Critical minerals exporting country
- Increasing international demand and rising prices for critical minerals
- Increase of investment and production of clean-tech commodities
- Positive effects on output and employment
- Positive wealth effects
- Improvement of current account and appreciation pressure on exchange rate
- Improvement of international investment position → more investment in international financial centres

\[ \text{Fossil fuel exports} \rightarrow \text{Wealth effects} \rightarrow \text{€/$/¥} \]

\[ \text{Tech exports} \rightarrow \text{Wealth effects} \rightarrow \text{€/$/¥} \]

\[ \text{Critical minerals exports} \rightarrow \text{Wealth effects} \rightarrow \text{€/$/¥} \]

Volz, Campiglio, Espagne, Mercure, Oman, Pollitt, Semieniuk & Svartzman: Transboundary Climate-related Risks: Analysing the Impacts of a Decarbonisation of the Global Economy on International Trade, Finance, and Money
Modelling the impacts of a decarbonisation of the world economy on trade

• We employ E3ME-FTT, a global macro-econometric model that integrates a range of social and environmental processes (Mercure et al., 2021).
  • A simulation-based integrated assessment model.
  • Covers 70 regions and 43 industrial sectors, with data starting in 1970.
  • The model estimates energy use for and trade in 12 widely traded fuels.
  • The model simulates on the basis of recent trends the diffusion of key technologies with a high level of granularity (power generation, transport, heating, steelmaking), covering over 80% of fossil fuel use across the economy.
  • The model incorporates a detailed representation of natural resources extraction, use and depletion, in renewables and fossil fuels, including data over 120,000 oil and gas assets worldwide, covering most existing resources and reserves.

• We estimate effects of a decarbonisation of global trade for different sectors for 2030, 2040 and 2050.
Differences in exports by sector between the IEA and Net-Zero SO scenarios

Note: Three time points are shown in each sector, 2030 (blue), 2040 (red) and 2050 (yellow).
Differences in imports by sector between the IEA and Net-Zero SO scenarios

Note: Three time points are shown in each sector, 2030 (blue), 2040 (red) and 2050 (yellow).

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Change in the trade balance relative to GDP

Note: Three time points are shown in each sector, 2030 (blue), 2040 (red) and 2050 (yellow).
Differences in output by sector between the IEA and Net-Zero SO scenarios

Note: Three time points are shown in each sector, 2030 (blue), 2040 (red) and 2050 (yellow).
Growth of alternative trade in RE, low-carbon technology and critical minerals

• Trade in low-carbon hydrogen is expected to develop over time.
  • Exports from gas and renewables-rich areas in the Middle East, Central and South America and Australia to demand centres in Asia and Europe.

• Growth of trade in low-carbon technology/capital goods.

• Increase in demand for critical minerals such as copper, lithium, nickel, cobalt and rare earth elements that are essential for many clean energy technologies.

• We are not yet able to model these trade flows due to a lack of data.

• The expected rise in trade in these areas may cause further, profound changes to international patterns of trade, with substantial impacts on the international macroeconomy.
International macroeconomic and financial spillovers

- Stranding of fossil fuel related assets will have transboundary wealth effects and financial stability implications.
  - A significant share of ultimate asset owners is located in OECD countries.
  - Transboundary exposures redistribute losses towards the global centres of finance and the most wealthy countries.
  - Could contribute to a destabilisation of global financial markets.

- Governments facing high transition risks face sovereign rating downgrades and a higher cost of capital at a time when a deteriorating current account balance increase the need for and dependency on external finance.
  - Countries with a heavy dependency on the fossil fuel economy may experience a sovereign debt crisis, which itself could have contagious effects internationally.

- Changes in growth prospects and macro dynamics will affect international financial flows.

- Data limitations constrain analysis of these effects!
Effects on countries’ international investment positions & the global monetary system

• Changing patterns of global trade will have substantial effects on countries’ balance of payments and international investment positions.

• These changes could have wider ramifications for international macroeconomic interdependencies and the international monetary system.
  • Historically, fossil fuel exporting countries have been among the biggest contributors to global macroeconomic imbalances.
  • A deterioration of the international investment position of fossil fuel exporting countries would put an end to large flows of investment of petrodollars into international financial centres, especially the US.
  • We may see new international investment flows from clean-tech and critical mineral exporters.
    • Whether these will go to the same destinations and use the same currencies as before is an open question and may also depend on geopolitical factors.
  • All this could also have wider implications for the international reserve system and the status of the dollar as the global lead currency.
Conclusion

• The changing patterns of trade are expected to have significant impacts on the balance of payments of both exporting and importing countries and on international financial flows.

• The stranding of fossil fuel related assets can have trans-boundary effects on wealth and financial stability.

• All these may have potentially meaningful ramifications for the international financial and monetary order.

• We need to compile better data on financial flows and exposures that will enable us to quantify international financial spillovers.