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Transition risks in global energy markets: Implications for Canada

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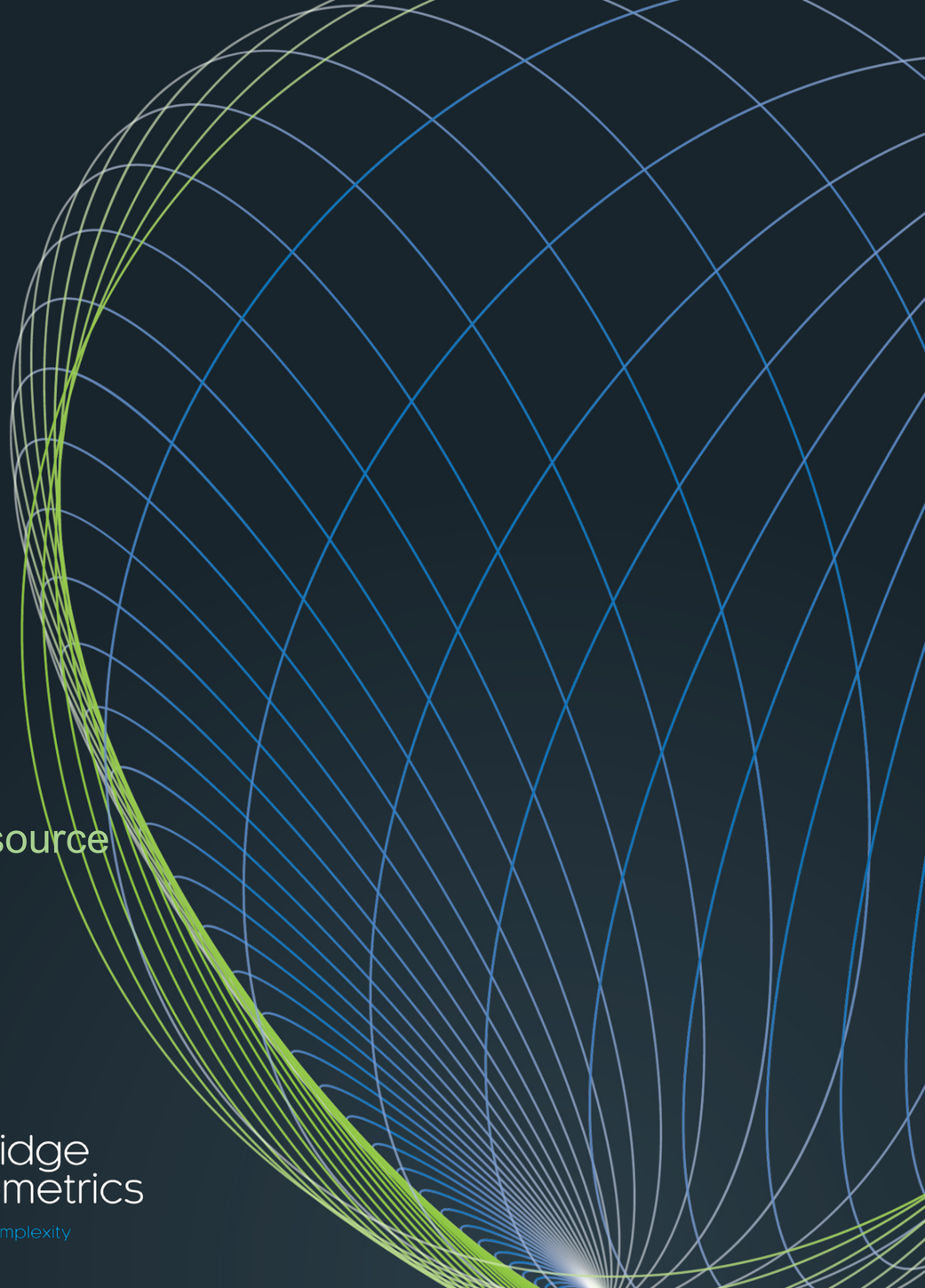

Our team:

- Energy & innovation research:
  - **J-F Mercure**, F. Nijsse, Y. Simsek
- Macroeconomics
  - **Hector Pollitt**, U. Chewpreecha, P. Vercoulen
- Policy and Law (domestic and international)
  - **Jorge Vinuales**, Pablo Salas, A. Lam
- Climate/Earth sciences
  - **Neil Edwards**, Phil Holden
- Finance & innovation
  - **Gregor Semieniuk**, Phil Holden

NERC-funded research on stranded fossil fuel assets

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FRANTIC
Financial Risk And The Impact of Climate change

Research grant as part of the
UK's Climate Resilience programme

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AND SYSTEM TRANSITION

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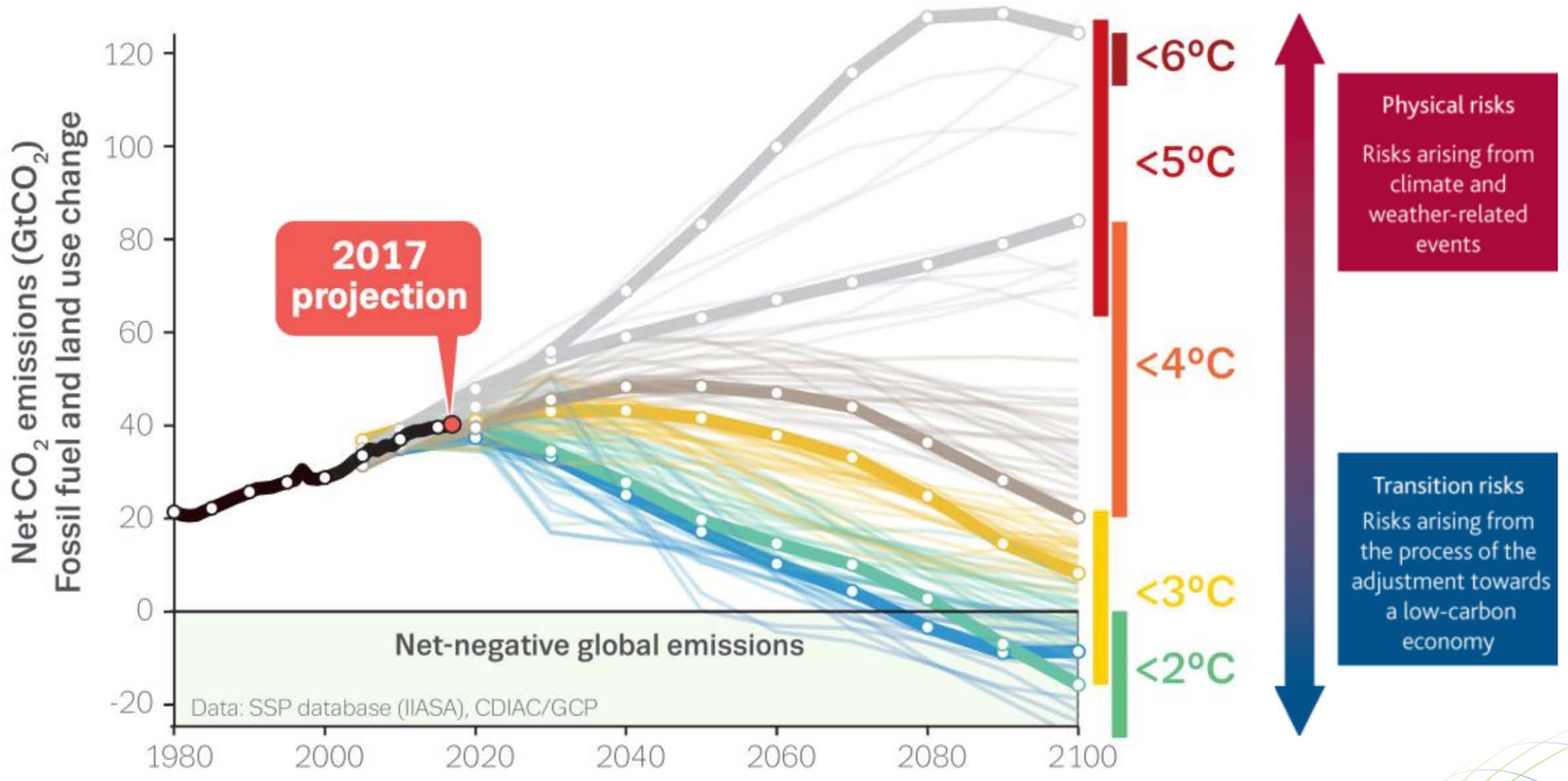
Financial risks and the impacts of climate change

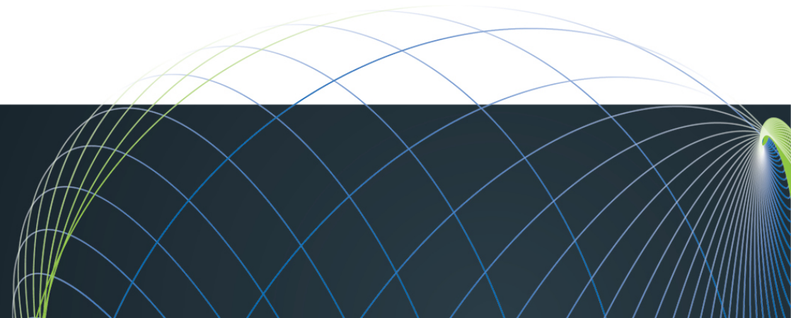
Focusing on ***transition risks*****:** who owns the risk in a rapid low-carbon transition?

Finance community: Are we already in a transition? Will fossil fuel demand peak? What is the risk? Who owns the risk?

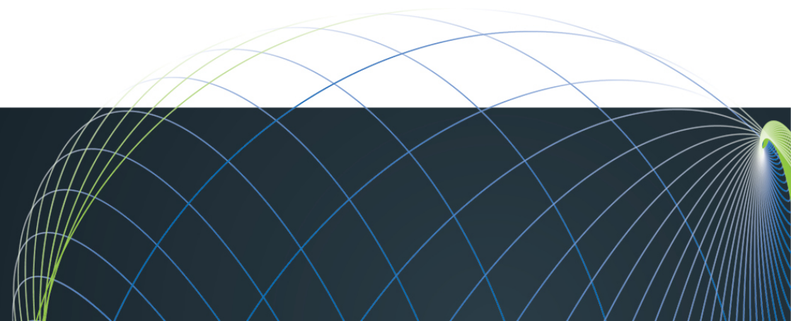


1- The method and scenarios
2- Results: I- The new energy geography
3- Results: II- The political economy of the energy transition

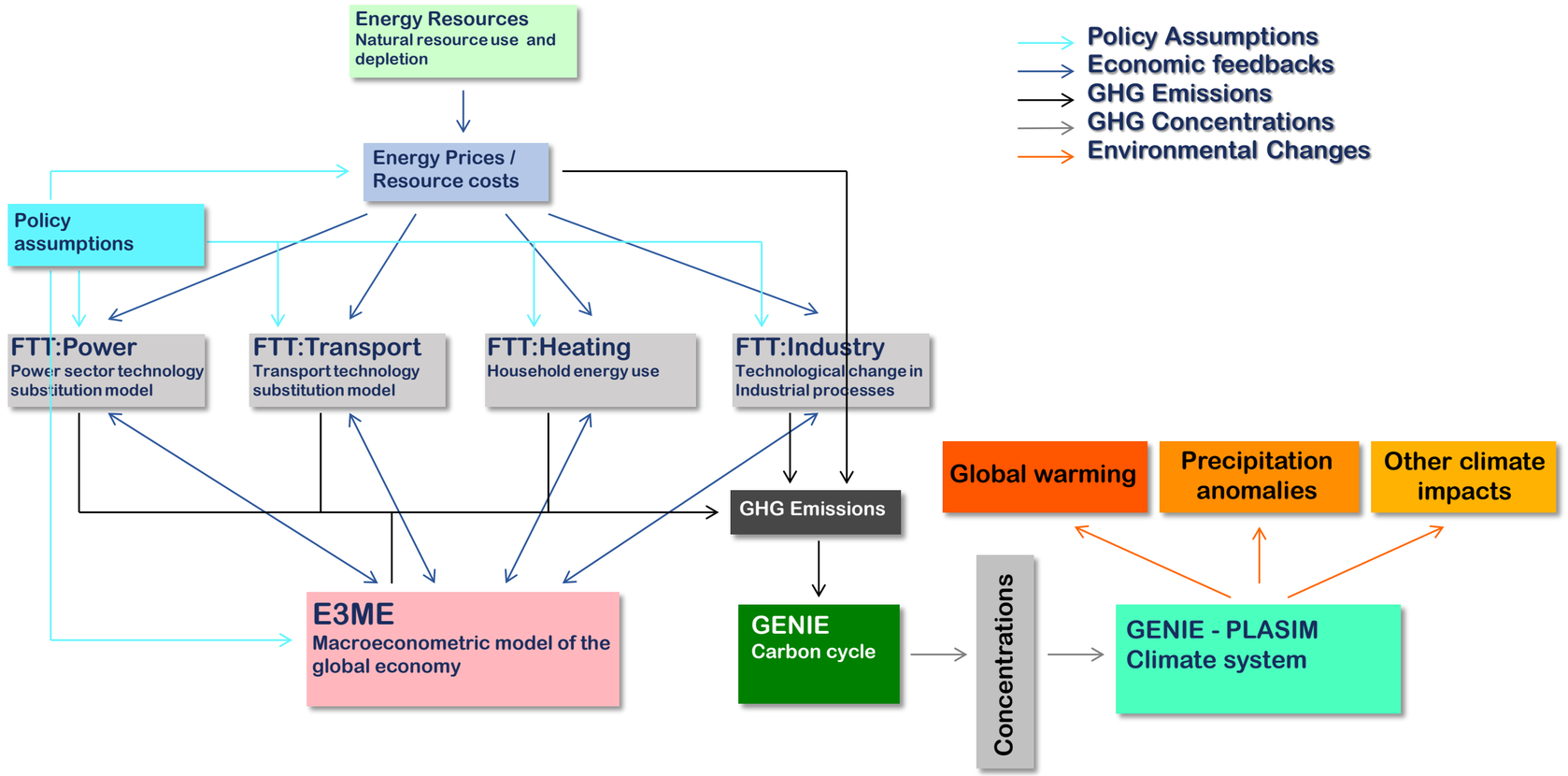
Preprint available at
https://www.researchsquare.com/article/rs-150151/v1



The method and scenarios



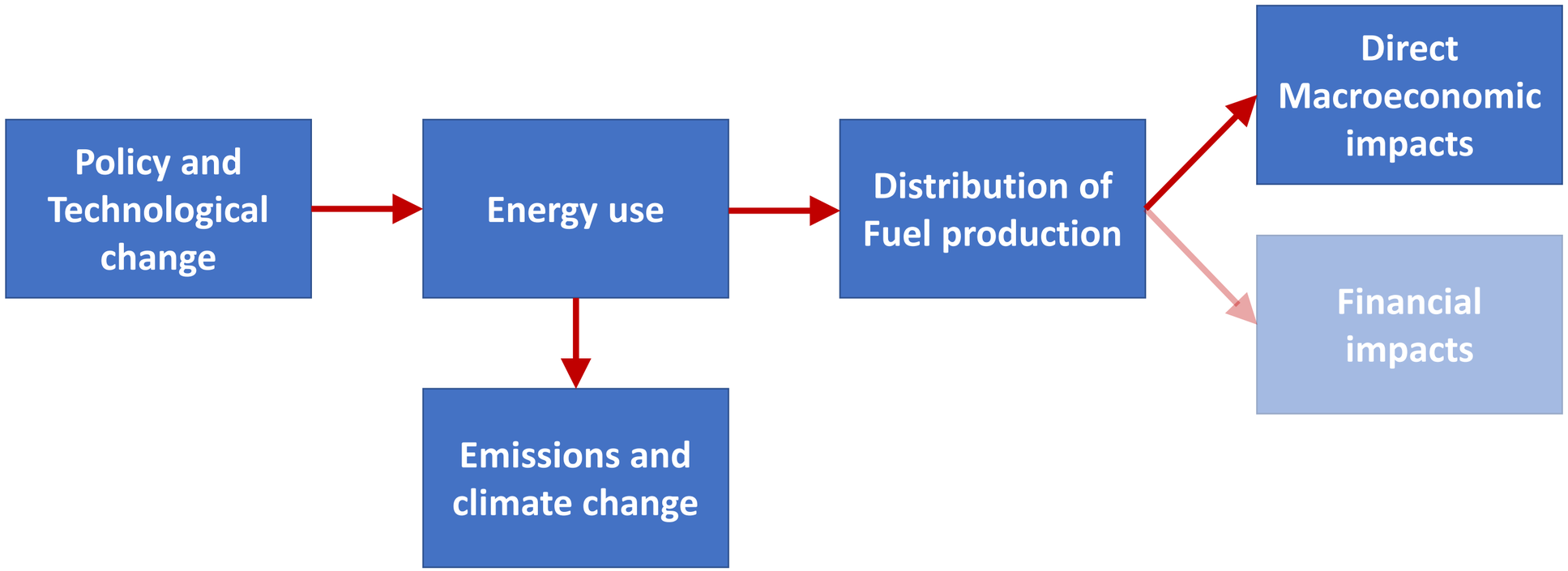
The E3ME-FTT-GENIE Integrated Energy-Economy-Climate Model for climate change policy research



Mercure et al., Energy Strategy Reviews (2018)

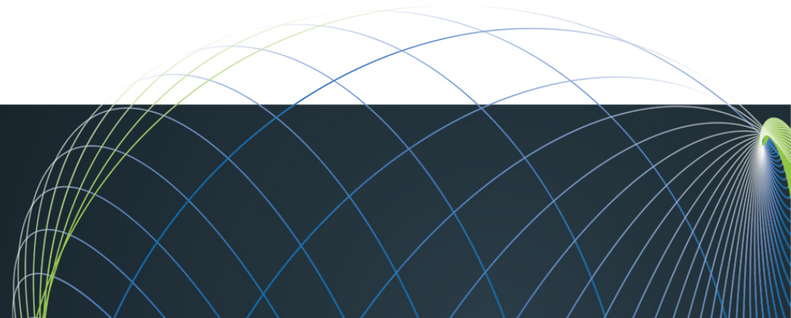
The method

Information flow:

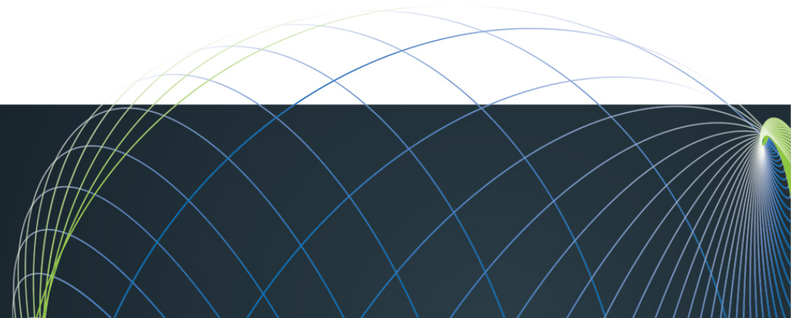


The Scenarios:

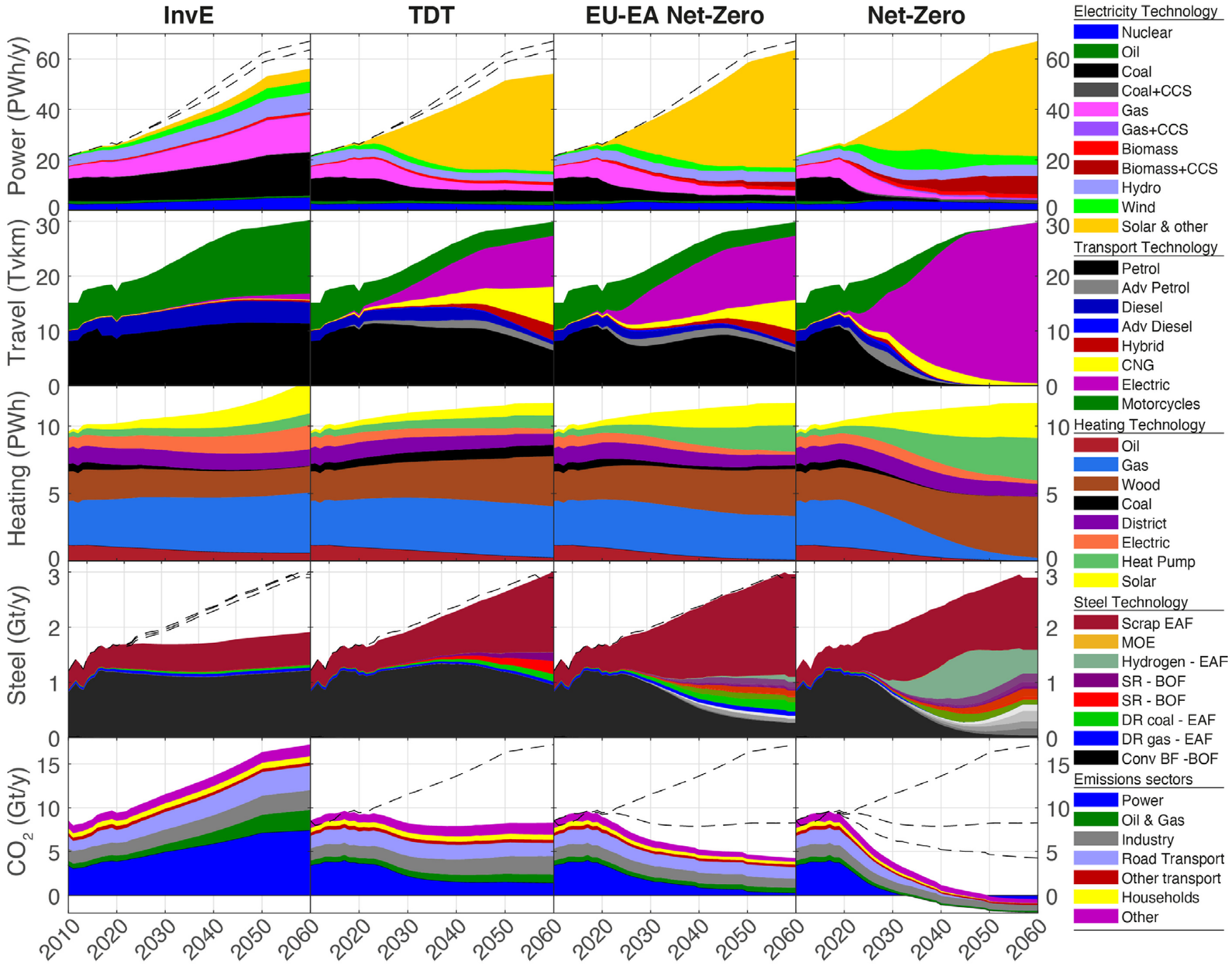
1. International Energy Agency's World Energy Outlook (**InvE**)
   - IEA WEO New Policies Scenario taken as benchmark
   - Median warming of **3.5ºC**
2. Technology Diffusion Trajectory (**TDT**)
   1. Calibrated against the current trends of technology diffusion
   2. Median warming of **2.6ºC**
3. Net-zero in Europe and East Asia (**EU-EA Net-Zero**)
   1. **2050 Net-zero** emissions in the UK, France, the EU as a whole, Japan, Korea; China in **2060**
   2. 50% probability of not exceeding **2ºC**
4. Net-zero in 2050 (**Net-zero**)
   1. Net-zero in 2050 worldwide (uses negative emissions)
   2. 50% probability of not exceeding **1.5ºC**



The Results: 1- The new energy geography



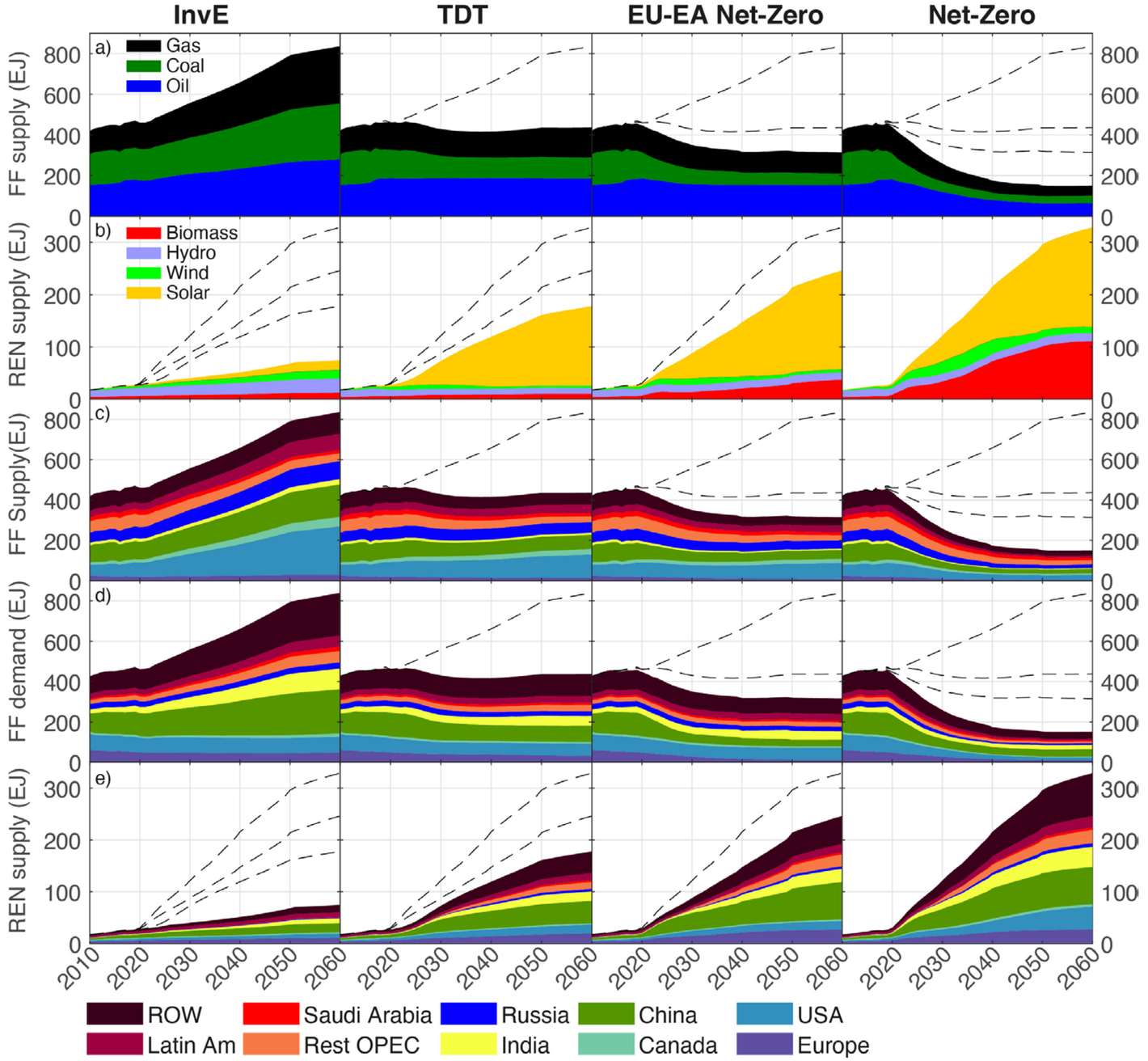
Scenarios of dynamic technology development



- **InvE**: limited technological change in baseline
- **TDT**: Current tech. trajectories imply lower fuel use and emissions
- **Net-Zero**: rapid tech. change to meet targets using climate policies
- **EU-EA-Net-Zero**: Higher emissions in non policy regions than in TDT

Results under review

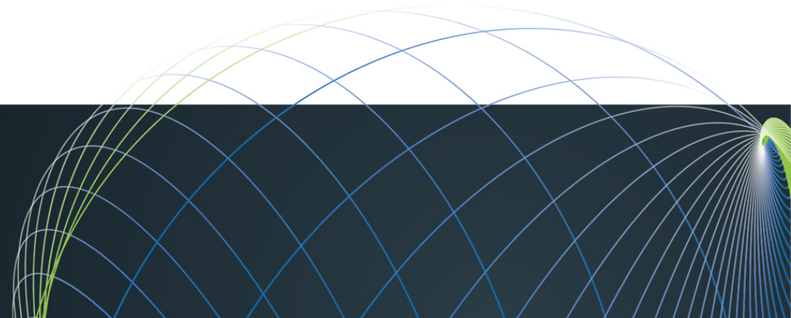
Primary energy supply, fossil and renewables



- Trends towards less fossil fuels
- Rapid growth of renewables in baseline
- Higher efficiency -> less energy in total
- Complete re-organisation of the geography of energy emerging
- Energy trade across the world substantially declines

Results under review

The Results: 2- The political economy of the energy transition



Different types of fossil fuel extraction

Oil

Conventional

OPEC

Offshore

Brazil, UK, Mexico…

Arctic

Russia…

Heavy Oil

Venezuela

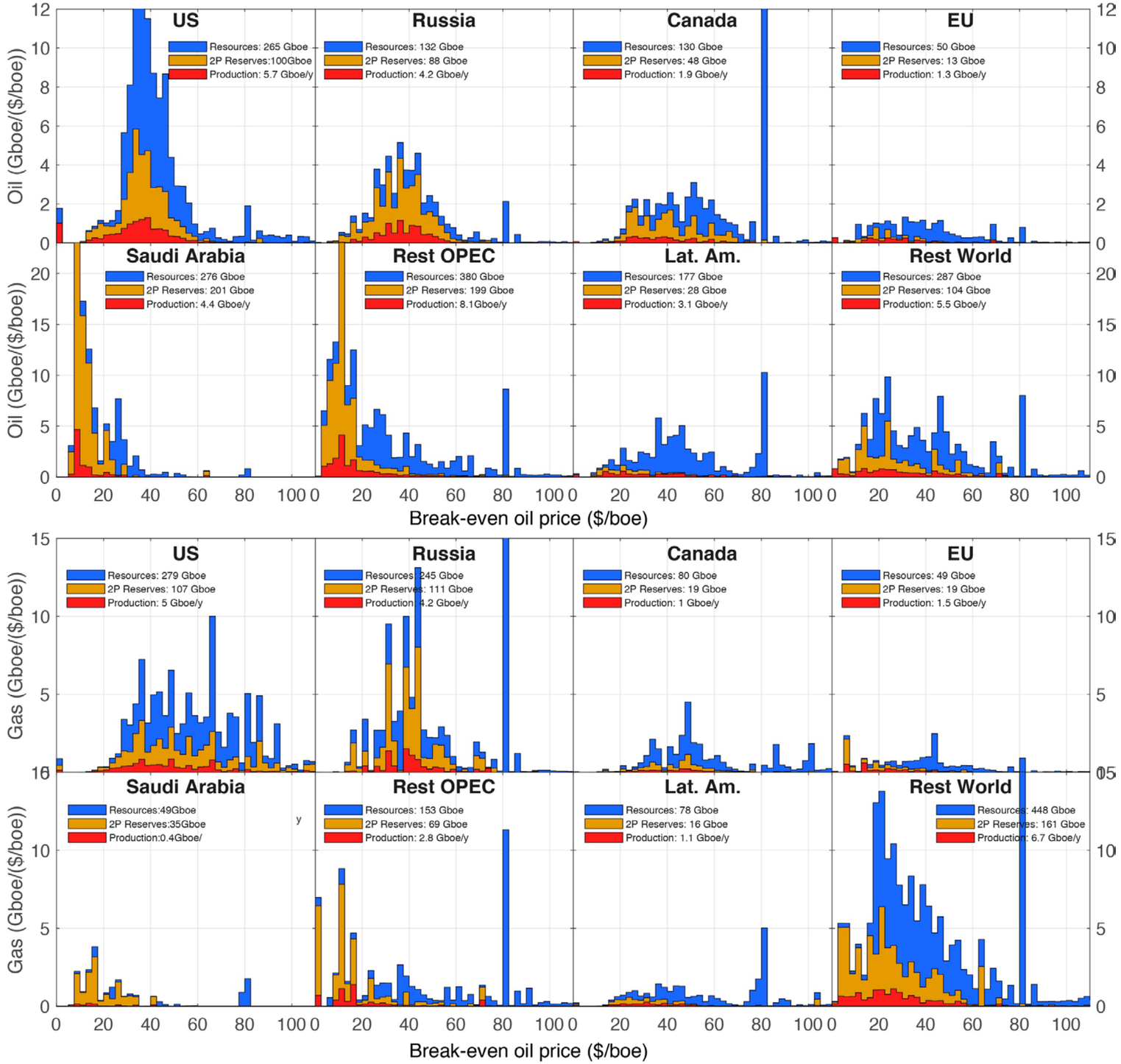
Shale oil

USA

Tar Sands

Canada

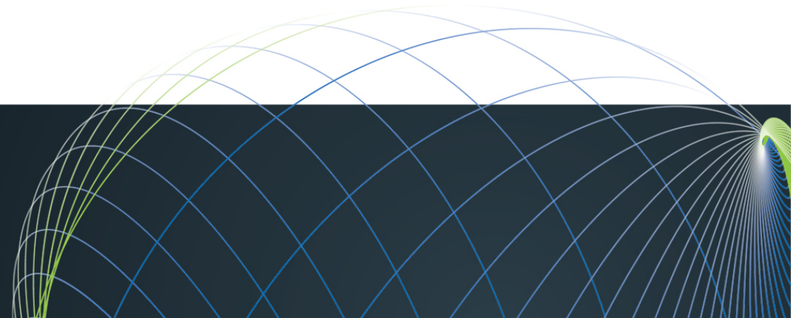
Increasing extraction cost



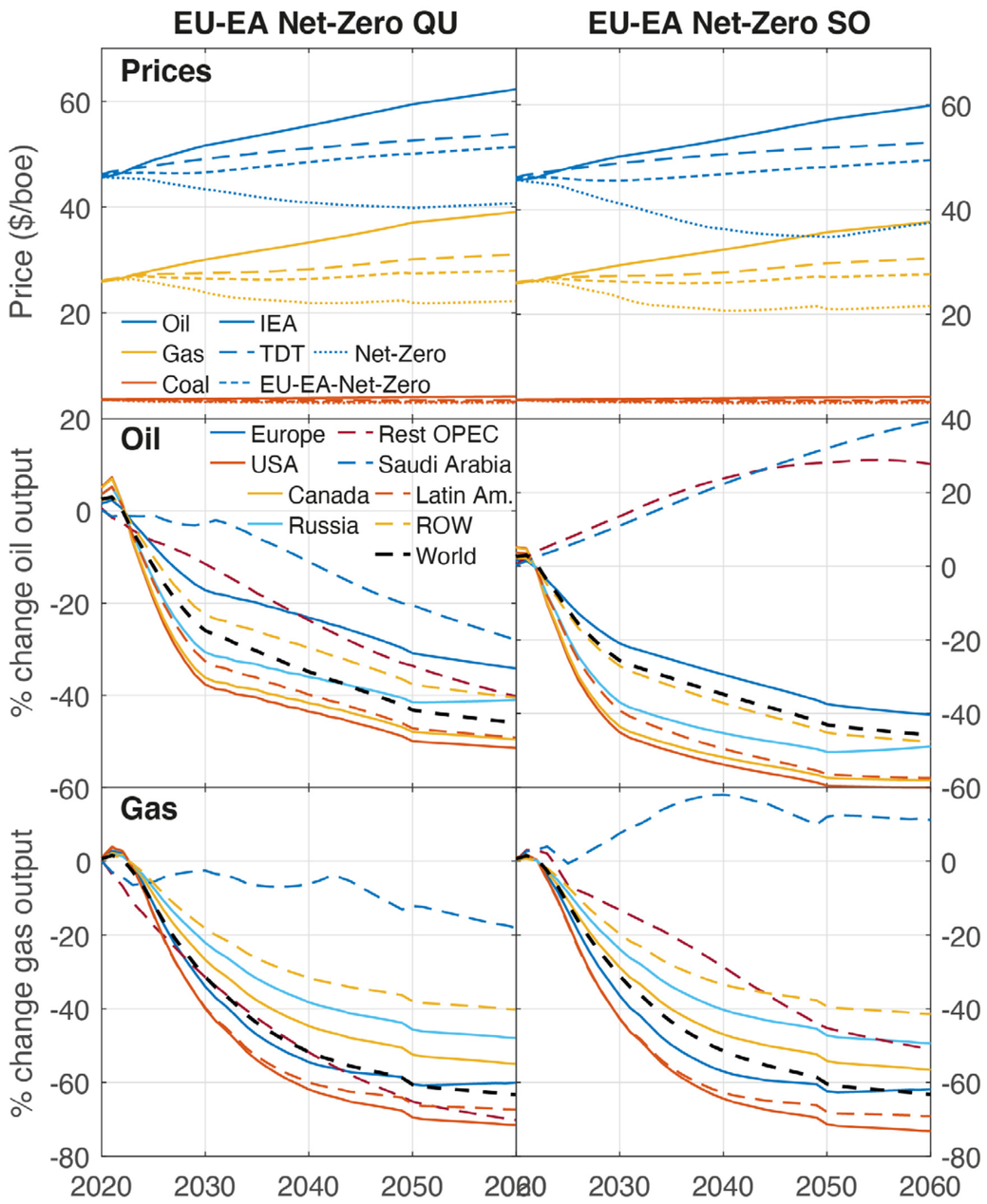
- Rystad data: 120k extraction sites worldwide
- Excessive reserves/resources
- OPEC can price-undercut all other regions
- 890 (oil) and 630 (gas) Gboe needed in TDT
- Sufficient resources in OPEC
- Substantial resources have low likelihood of ever being used

Scenarios refinements:

1. The allocation of fossil energy markets strongly depends on specific market players
   - Oil price wars: OPEC can grab market share
   - Avoiding insolvency
2. OPEC Quotas (QU) scenario in the current policy regime
   - OPEC maintains current shares of oil and gas markets, despite demand declines
   - Price is maintained higher
3. OPEC Fire-Sale ‘sell-out’ (SO) scenario in the current policy regime
   - OPEC floods markets
   - Downward pressure on oil/gas prices
   - Production moves to the Middle-East



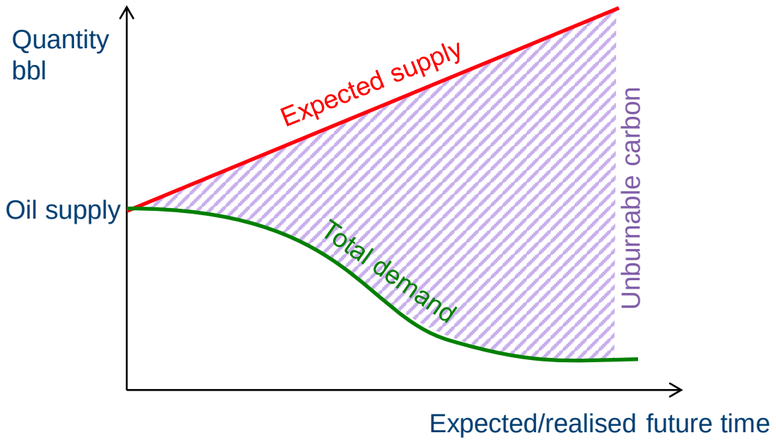
Oil & gas production loss

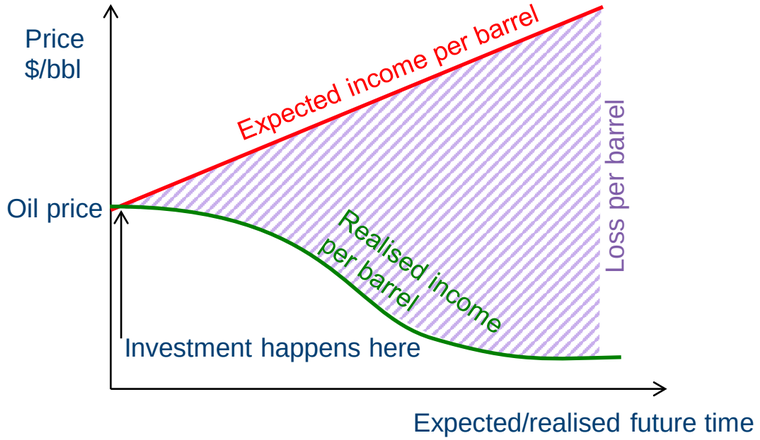


- Fossil fuel prices stagnate or decline
- Oil & Gas production losses substantial in current policy regime
- Production losses evenly distributed in QU scenario
- Production losses heterogenous in SO scenario

Results under review

Our definition of Stranded Fossil Fuel Assets





Stranded Fossil Fuel Assets:

Sum of discounted (price x quantity) until 2035

Stranded fossil fuel assets by scenario

Total Coal + Oil + Gas worldwide, 2022-2036, 6% discount rate

Scenario realised

EU-EA Net-Zero

Global Net-Zero

Scenario Expected

All fossil fuel assets

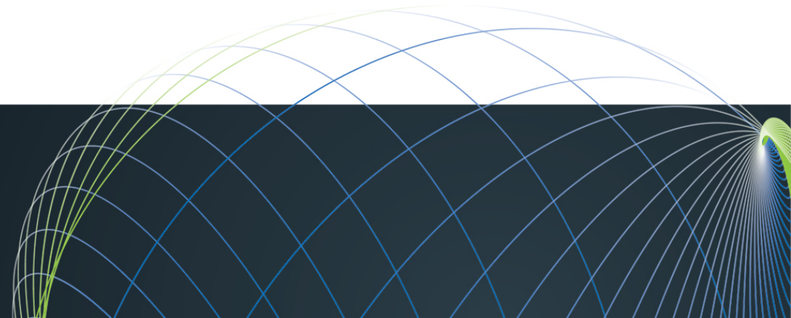
Total	InvE	InvE QU	InvE SO	TDT	TDT QU	TDT SO	EU-EA N-Z	EU-EA N-Z QU	EU-EA N-Z SO	Net Zero	NetZero QU	NetZero SO
InvE	0.0	-0.3	0.2	3.9	3.9	4.0	7.2	7.1	7.3	11.4	11.2	11.7
InvE QU		0.0	0.5	4.2	4.2	4.3	7.5	7.4	7.7	11.8	11.5	12.0
InvE SO			0.0	3.7	3.6	3.7	7.0	6.9	7.1	11.2	10.9	11.5
TDT				0.0	-0.1	0.0	3.2	3.2	3.4	7.5	7.2	7.8
TDT QU					0.0	0.1	3.3	3.2	3.5	7.6	7.3	7.8
TDT SO						0.0	3.2	3.2	3.4	7.5	7.2	7.7
EU-EA N-Z							0.0	-0.1	0.2	4.3	4.0	4.5
EU-EA N-Z QU								0.0	0.2	4.3	4.0	4.6
EU-EA N-Z SO									0.0	4.1	3.8	4.4
Net Zero										0.0	-0.3	0.2
NetZero QU											0.0	0.5
NetZero SO												0.0

- $4-12tn @ 6% discount rate, $7-19tn undiscounted (2020 dollars)
- 90% of which is oil & gas (coal < $1tn)
- 2018 published results: $1-4tn @ 10% discount rate, $3-12tn undiscounted (2016 dollars)
- Differences is from the updated rate of diffusion of tech

Results under review

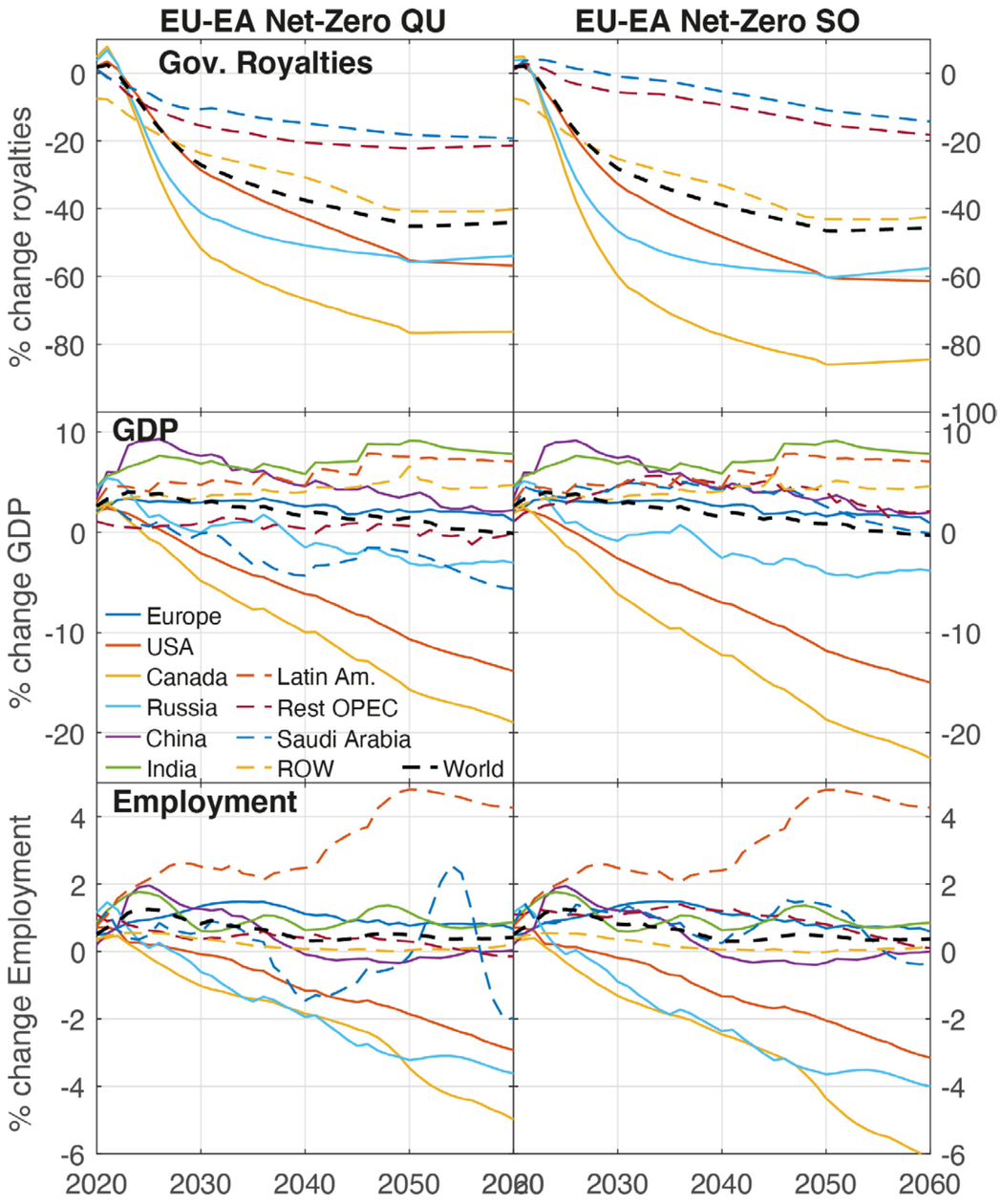
Decarbonisation has 3 main impacts to the real economy:

1. Low-carbon investment boosts economic activity
   - Building activity ↗, GDP ↗, jobs ↗
   - Implies large investment and possible debt burdens
2. Decline in demand for fossil fuels
   - Excessive supply, FF prices ↘, production ↘, GDP ↘, jobs ↘
   - Declines in investment across supply chains
3. Trade balance:
   - Importers:
     Reduces energy imports and redresses trade balance,
     income ↗, competitiveness ↗, GDP ↗
     (e.g. Europe, China, Japan, India)
   - Exporters
     Decline of the fossil fuel industry, jobs ↘, GDP ↘
     (e.g. USA, OPEC, Canada, Russia)



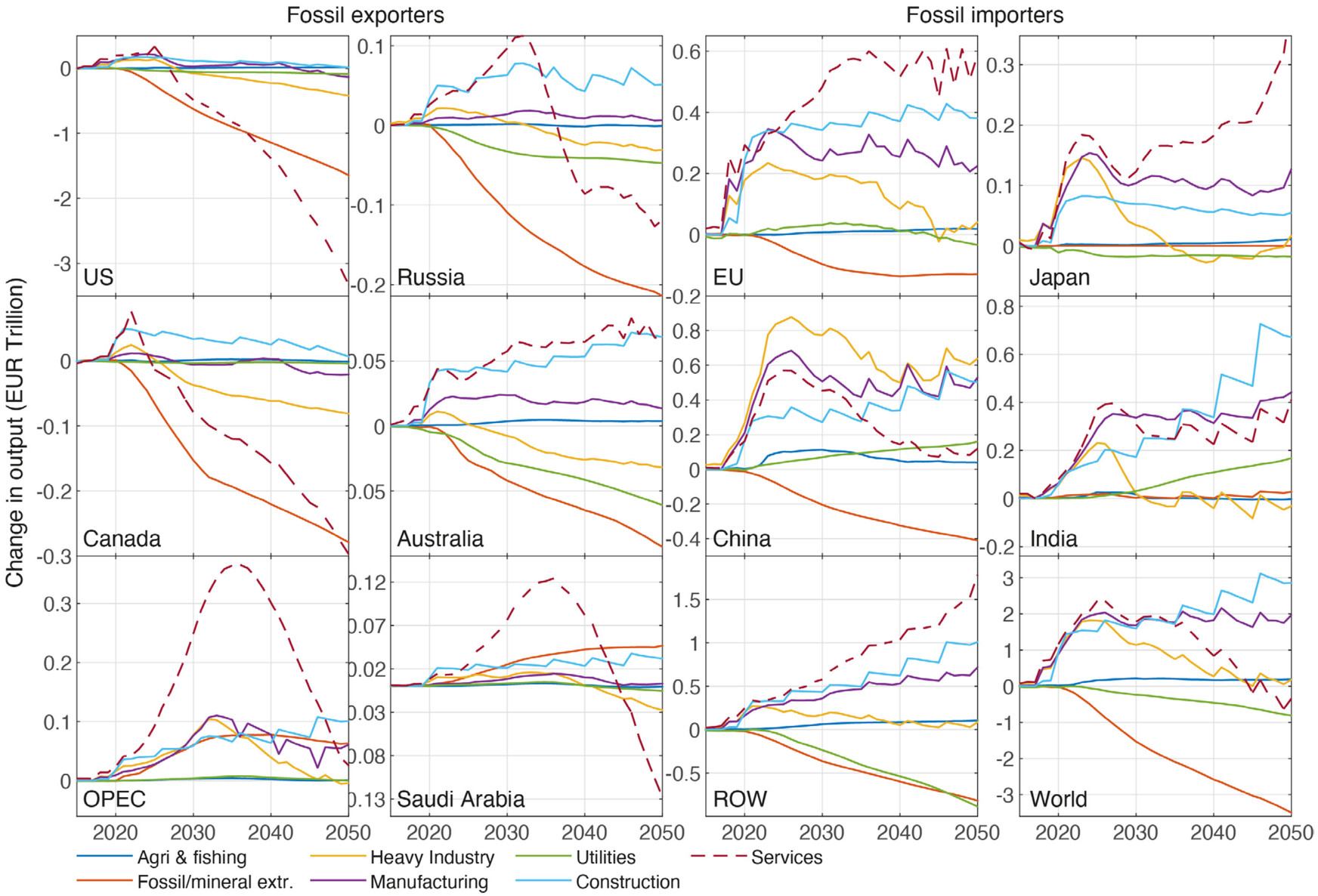
Oil & gas production loss

- Macroeconomic model used: E3ME-FTT
  - Industry in 43 sectors
  - World in 61 regions
  - 12 types of fuels
  - IO tables, bilateral trade
- Current policy regime implies:
  - GDP and employment losses in fossil exporters (US, Canada, Russia)
  - GDP and employment gains in fossil importers (EU, China, India, Japan, Korea)
  - OPEC: depends on output strategy
  - Global GDP: moderate increase



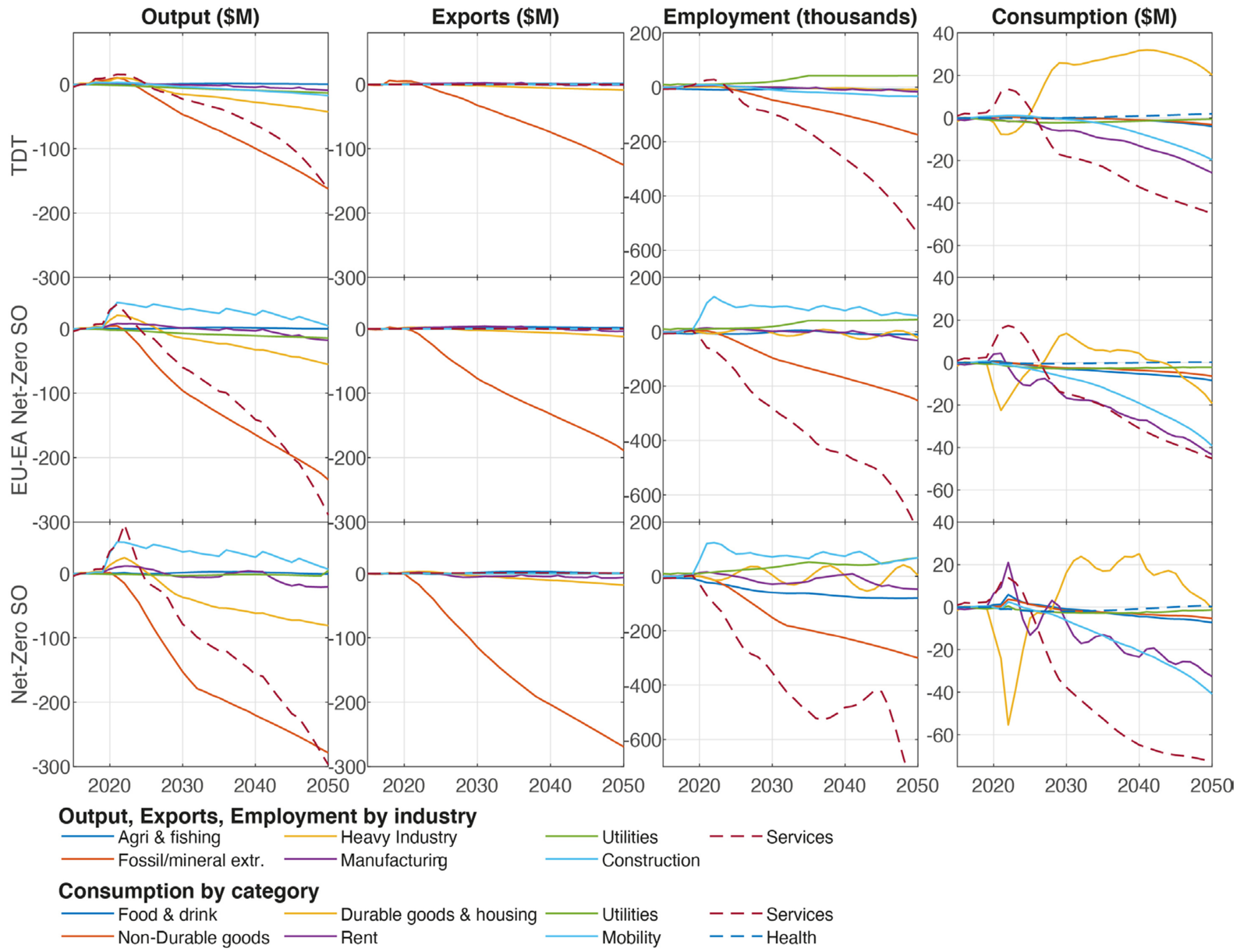
Results under review

End of the Age of Oil: structural change in different economies



Results under review

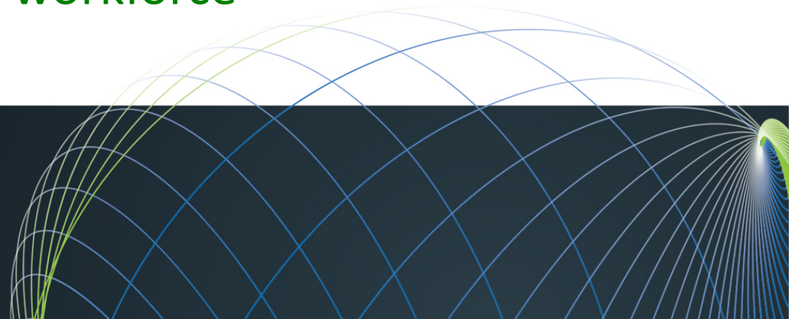
Canada case: what does it mean?



Results under review

Canada: what are the ways forward?

1. Reduce exposure to losses from oil and gas in the economy
   - With oil/gas over-supply worldwide, prices will be volatile
   - Reduce Canadian economy exposure to volatility of oil/gas prices
   - Reduce exposure to financial contagion
2. Support innovation and the creation of new industries (low-carbon or other)
   - Create new jobs to offset job losses
   - Create new industrial capabilities
3. Create programs and policies to help people and businesses through the transition
   - Job losses through transition are geographically concentrated
     - Regional economic decline is self-reinforcing
   - Policy to counter regional economic challenges
     - Industrial policy to create new regional capabilities (e.g. renewables)
     - Innovation and training programs to re-deploy the workforce



Thank you!

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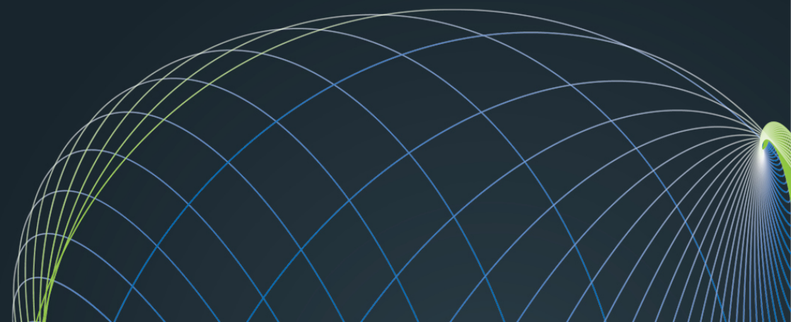

Assessing transition risks in global energy markets
Part II:
The financial geography of stranded oil & gas assets

Talk à L'Institut de l'Energie Trottier
9 Février 2021

Gregor Semieniuk

University of Massachusetts Amherst

POLITICAL ECONOMY RESEARCH INSTITUTE
PERI
University of Massachusetts Amherst

Contents

- Financial geography
- Sneak preview with a Canada focus
- Method for translating losses

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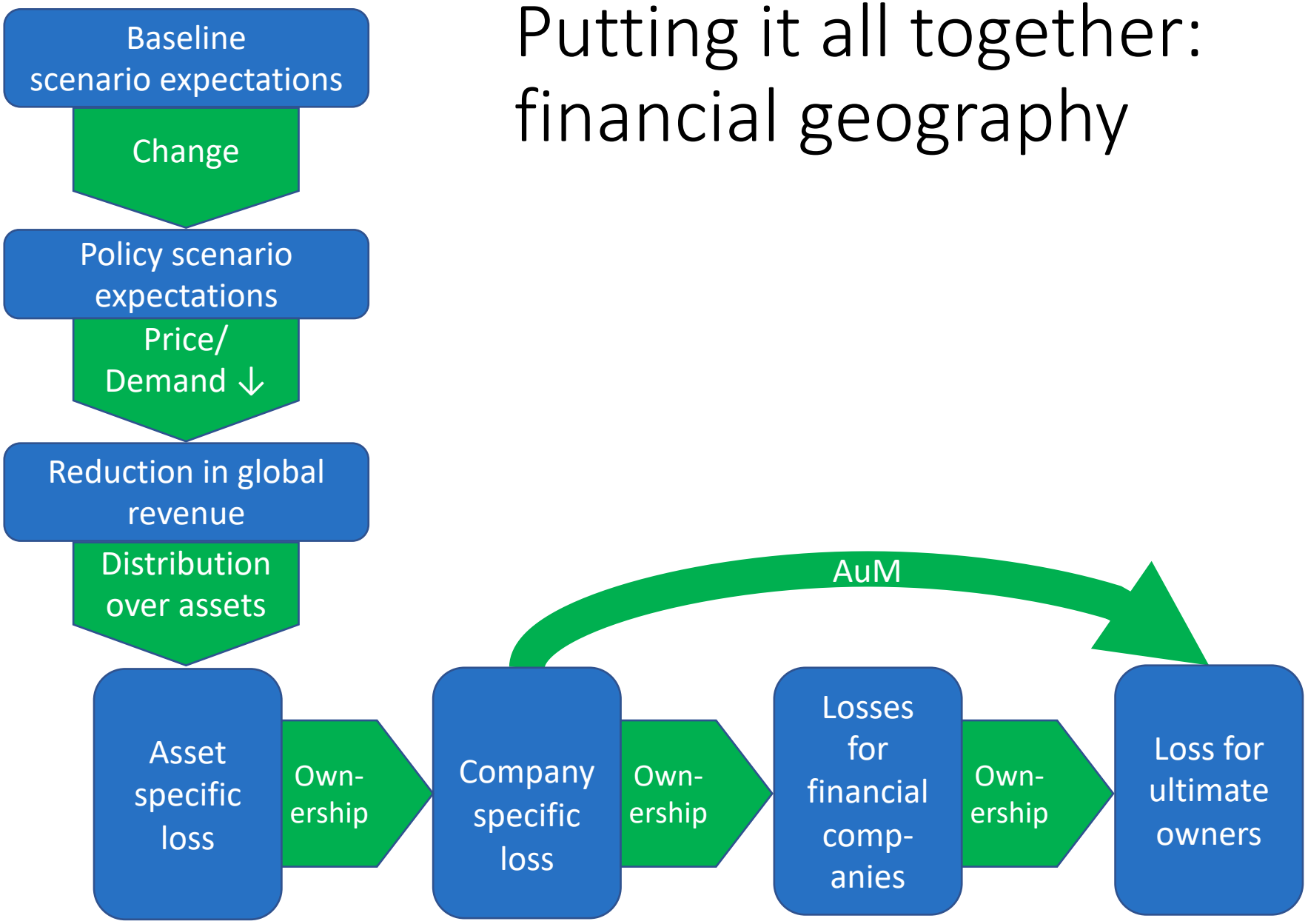
Transition costs for investors

- Transition not only changes value added (flow) but also valuation (stock)
- Mispricing of assets at the root
- Unanticipated changes in expectations about future revenue alter net present value of assets and hence company valuation
- And: unanticipated changes in cash flow can lead to bankruptcy
- All that can potentially have systemic consequences (financial instability)

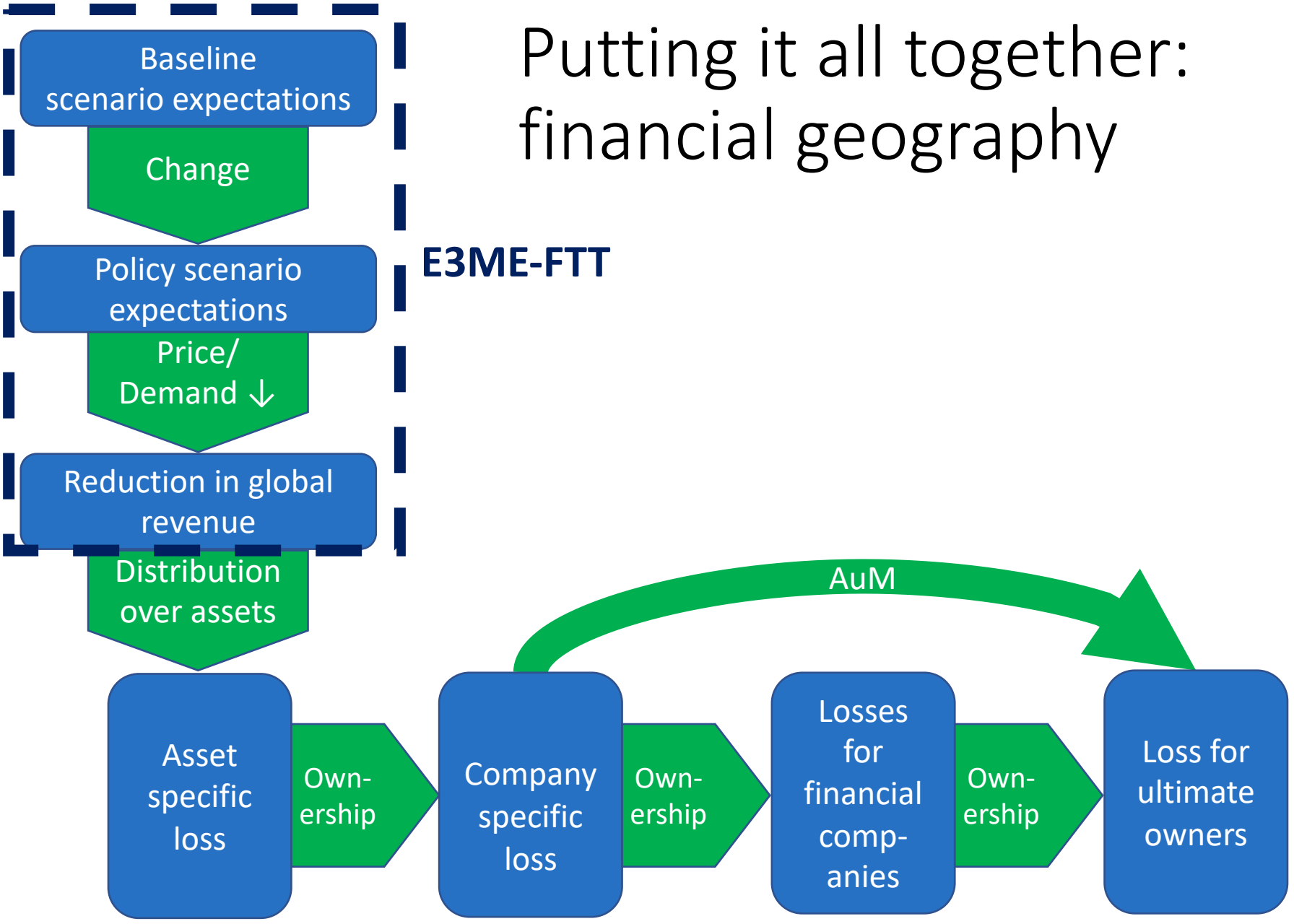
Many estimates of transition costs but only of individual components

- Either stranded assets in the fossil fuel sector e.g. McGlade & Ekins (2015), Tong et al. (2019), Smith et al. (2019) Fofrich et al. (2020)
- Or financial system stress tests e.g. Battiston et al. (2017), financial regulator/central bank reports
- But not both integrated, moreover feedback into rest of economy at most qualitative
- For a review see Semieniuk, Campiglio, Mercure et al. (2021, Wiley Interdispl. Rev. Clim. Change)

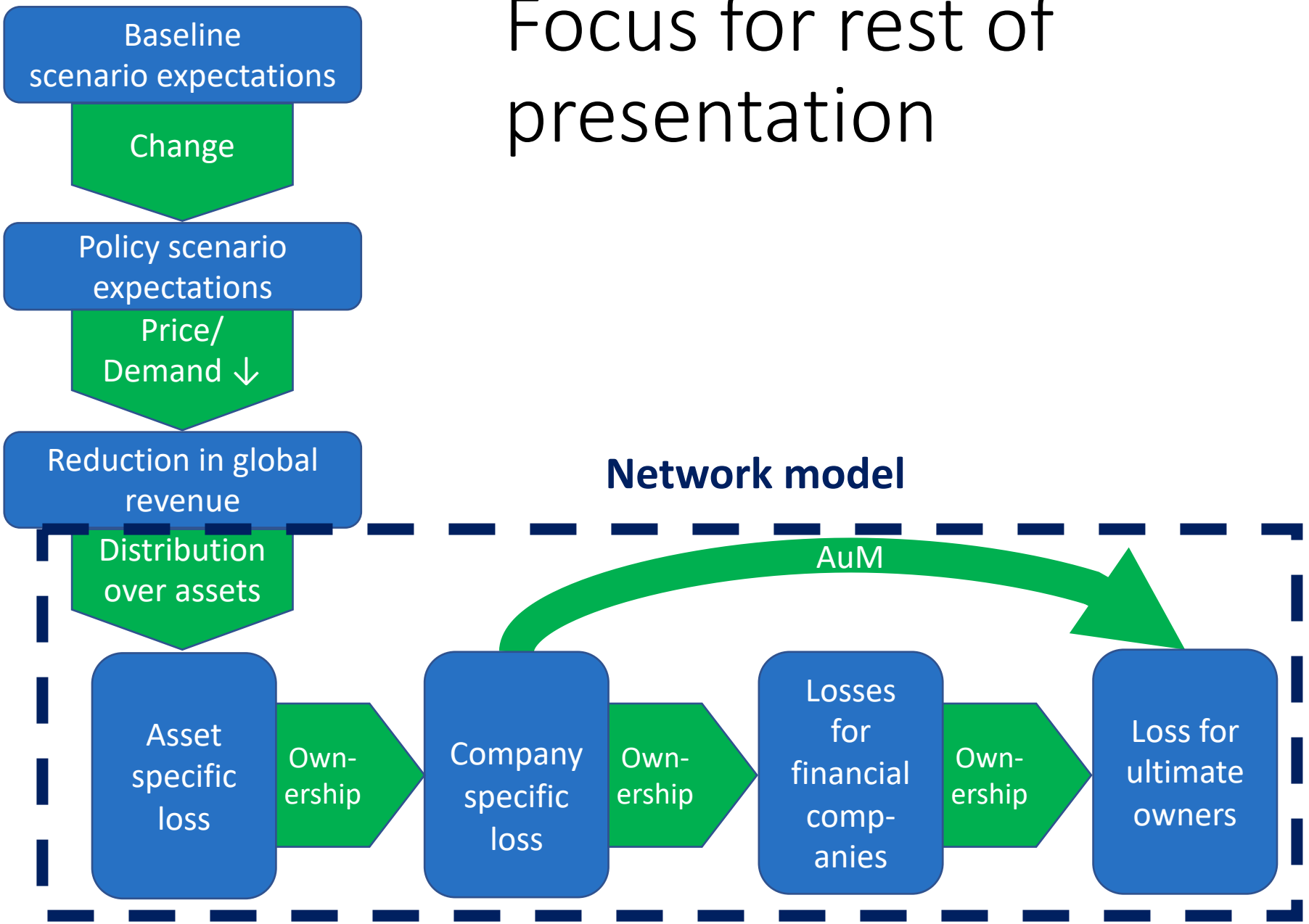
Putting it all together: financial geography



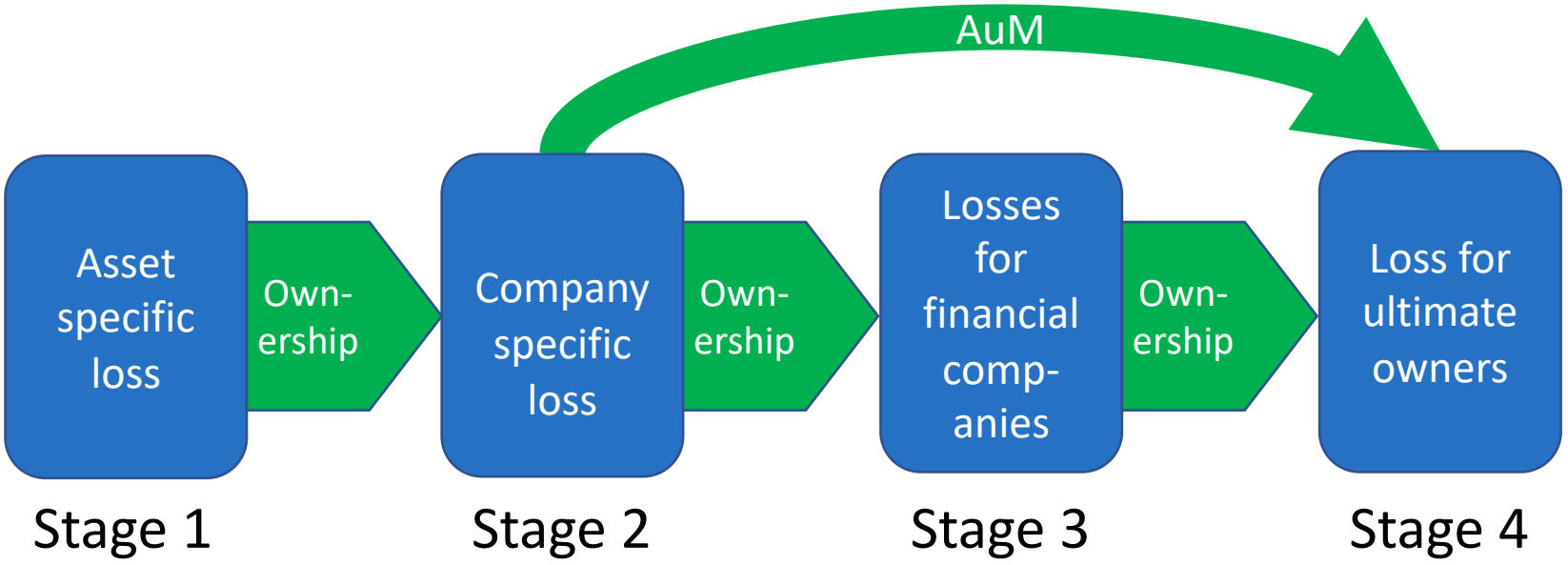
Putting it all together: financial geography



Focus for rest of presentation



Focus for rest of presentation



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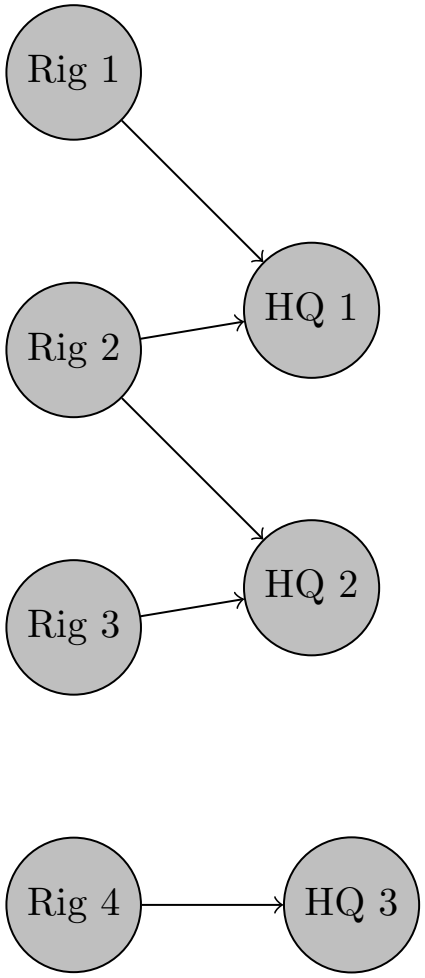
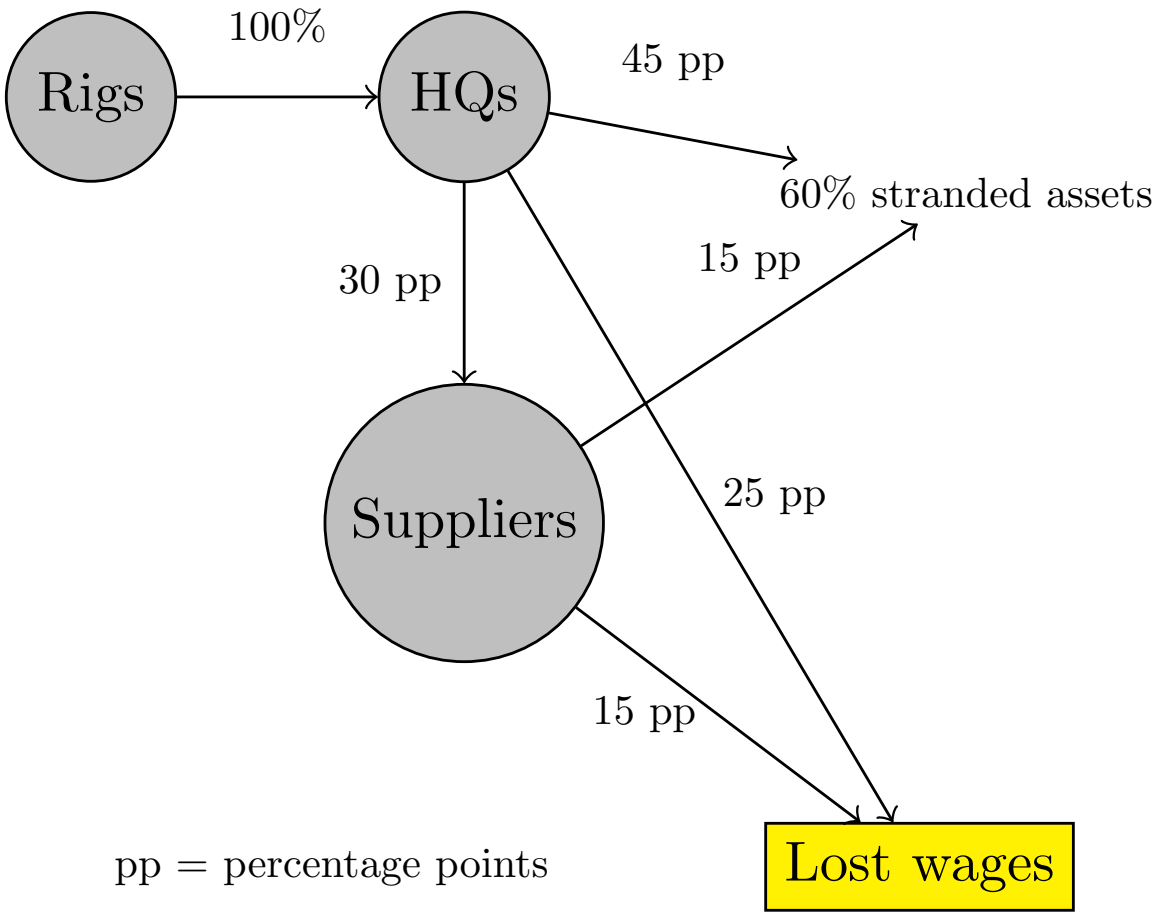
Stage 1 to 2: Allocating stranded assets to headquarters

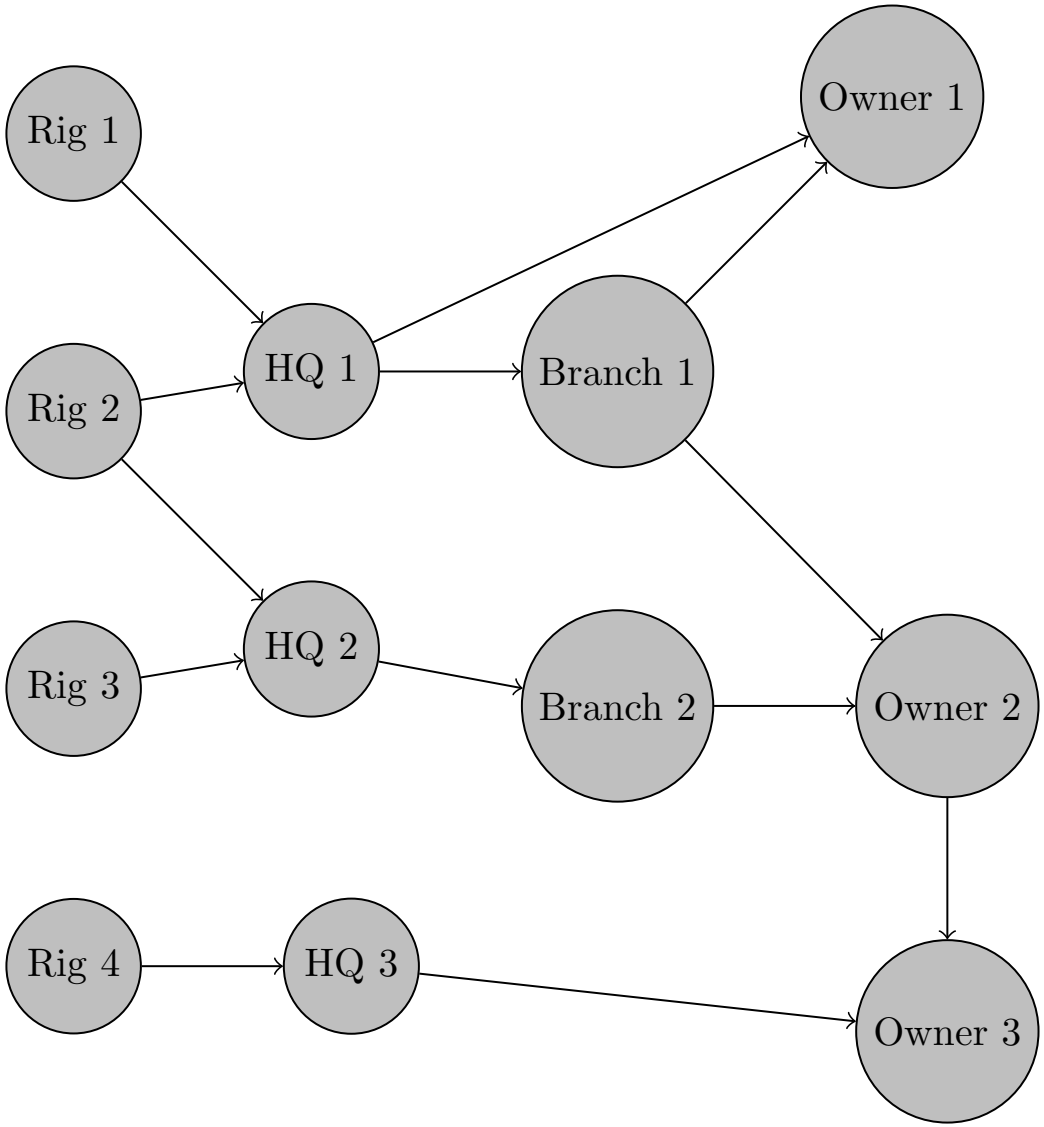


Edge strength:
the discounted stream of
lost future revenues
from stranded Rig x to HQ y
scaled by ownership share
of HQ y in Rig x

Stage 1 to 2: Calculating loss to balance sheet



Step 2 to 3 & 4: Net loss propagation



Loss propagation:
loss fully passed on
until leaves reached

Leaves (Owner) can be

- individuals
- governments
- corporate ultimate owners (lacking further data)

To keep in mind, all this assumes

- A particular baseline and policy combination
- zero stabilization policy
- zero financial upside risk from low-carbon investments (diversification away from fossil fuels)
- zero climate change ‘physical’ risks

… so plenty of space for policy to mitigate risks

Conclusions

- Canadian companies, shareholders and fund investors (pensions) invested in companies that could sustain losses to valuation
- Canadian ownership structure predicts low government liabilities but large individual shareholder losses
- Some companies risk losses large relative to their equity; questions about cash flow and stability arise
- Energy transition trajectories could benefit from taking these financial risks into account, and need also consider upside risks from investing in low-carbon alternatives