Climate Economics and Financial Markets

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“Climate change and financial risk”
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CO$_2$ Emissions: World

Source: CDIAC; Friedlingstein et al 2019; Global Carbon Budget 2019
CO₂ Emissions: Regions

Source: CDIAC; Friedlingstein et al 2019; Global Carbon Budget 2019
CO₂ Emissions: Per Capita

Source: CDIAC; Friedlingstein et al 2019; Global Carbon Budget 2019
Global emissions with agreed temperature targets

b) Stylized net global CO$_2$ emission pathways
Billion tonnes CO$_2$ per year (GtCO$_2$/yr)

CO$_2$ emissions decline from 2020 to reach net zero in 2055 or 2040

IPCC (2018)

c) Cumulative net CO$_2$ emissions
Billion tonnes CO$_2$ (GtCO$_2$)

Cumulative CO$_2$ emissions in pathways reaching net zero in 2055 and 2040
CO\textsubscript{2} and GDP

- World
- UK
- Sweden
- British Columbia

Source: CCC analysis 2019

Source: BC Government
Economic and population growth

Become endogenous using appropriate theory!
World: Shared Socioeconomic Pathways

Which path?
- Economic theory
- Policies

Source: CDIAC; Friedlingstein et al 2019; Global Carbon Budget 2019
Climate Economic Theory: BCE Model

Resources and Pollution

Bretschger and Karydas (2019)
BCE Model

Effects of productivity ($\Omega$), discounting ($\Delta$), and depreciation ($\Lambda$) on growth.

Bretscher and Karydas (2019)
Climate Policies

Figure 7. Effects of different policies (solid – baseline model, dashed – effects of policy).
(a) Carbon taxation (b) Decommissioning (c) CCS (d) Adaptation.
Quantitative Results

• Per capita consumption growth rate become somewhat lower with stringent climate policy

• Policy effects have to be compared to development without a policy

• Risk has to be added to the analysis
Climate Induced Risk and Growth

Bretschger and Vinogradova (2019)
Climate Induced Risk and Growth

Trend consumption growth

\[ g^* = \frac{1}{\varepsilon} \left\{ A \left( 1 - \frac{\phi}{\sigma} \right) - \rho + \lambda (\varsigma - 1) \right\} \]

Optimal climate abatement

\[ \theta^* = \frac{\phi}{\sigma} - \frac{\lambda \omega^{1-\varepsilon} \ln \omega}{A} \]

Bretschger and Vinogradova (2018)
Best Policy Response to Climate Risk

• Optimal policy considers
  • Size of expected damages
  • Arrival frequency

• Which depends on stock of greenhouse gases

• Higher risk and uncertainty asks for more stringent policies

• Theory shows how optimal policies are affected by risk aversion, abatement efficiency etc.
Climate Policy and Financial Flows

Paris Climate Agreement

Art. 2.1.c “Making finance flows **consistent** with a pathway towards low greenhouse gas emissions and climate-resilient development.”
Research strands

Natural (physical) environment
State of the atmosphere
Real Economy
Direction of investments
Monetary Economy
Finance flows
Policy
Climate policy and the financial sector

Climate Policy
- Optimal policies: mitigation, adaptation
- Suboptimal policies: level of ambition, policy mix, costs of policies

Public Funds
- Optimal allocation: funds alignment, fiscal instruments
- Suboptimal allocation: policy cycles, political economy barriers

Financial Sector
- Optimal asset allocation: Perfect foresight, unbiased decisions
- Suboptimal allocation: systemic errors, bubbles, bet on policy environment (“uncertainty”)
Climate policy and the financial sector

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Scope of Article 2.1.c
Insights from academic research

- Financial Markets
  - Performance of sustainable investments
  - Mispricing of climate risks in financial markets
  - Systemic climate risks amplification

- Evaluation of tools
  - Effective Disclosure
  - Effective Engagement
  - Effects of Divestment

- Financial Markets Evaluation of tools
Stranded Assets

• Uncertainty and misguided expectations in markets
  • Examples
    • Technology impact
  • Uncertain policies
    • Empirics/ theory
The Fall of General Electric (GE)

- GE was born 1892 and quickly became a household name.
- For many it was the most important US company.
- 2018, GE's more than 100-year run on the Dow Jones Industrial Average came to an end.

- 2019 GE will demolish a California natural gas-fired plant with 20 years remaining in its technical life.
- The plant will become a battery storage site
- GE lost nearly $200 billion within a few years by betting on fossil fuels.
The Fall of Murray Energy

- Murray Energy, once a symbol of American mining prowess, has become the eighth coal company in a year to file for bankruptcy protection.
- The nation’s largest privately held coal company has nearly 7,000 employees and operates 17 mines in six states. It produces more than 70 million tons of coal annually.
- But with utilities quickly switching to cheap natural gas and renewable sources like wind and solar power, Murray and other coal companies have been shutting down mines and laying off workers.
- Murray was most closely identified with Trump administration promises to reverse the industry’s fortunes.
Policy: CO$_2$ Tax Rates

Tax rates jump at irregular dates with different size: **Policy uncertainty**

- **Sweden**

- **Switzerland**
Policy Uncertainty

Stochastic tax rates

\[ dT_t = K_t(\tau dt + \gamma_t dq) \]

Endogenous tax jumps

\[ \gamma_t = \bar{\gamma} + \eta \left( \frac{G_t}{K_t} \right)^\chi + \varepsilon \left( \frac{E_t}{G_t} \right)^\xi \]

Bretschger and Soretz (2018)
We've always done it this way before.

We've never done it that way before.

Pigou taxes

Stochastic taxes
Thank you for your attention!

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References


Climate-related risks, opportunities and financial impact

Systematic policy approach

**Climate policy targeting finance**

- Disclosure requirements (mandatory, standards)
- Fiduciary duties clarification
- Stress tests (mandatory, standards, all institutions)
- Climate alignment strategies and progress

**Overall climate policy**

- Stringent mitigation policies
- Compensation of adverse side-effects
- UNFCCC reporting (2.1.c in transparency, NDCs, Global Stocktake provisions)
Article 2.1.c beyond national implementation

Driving Action

Raising Ambition
- Art. 14: Global Stocktake
- Art. 14.9: Mid-century strategies
- Art. 7.10: Adaptation communications
- Art. 9.5: Ex-ante Finance communications

Art. 3: NDC communications

Art. 6: Cooperative Mechanisms
- Art. 9: Financial Support
- Art. 13 Transparency: NDC progress, support
- SCF Biannual Reports

Tracking Progress