Climate Change, Monetary Policy and Inflation

Warwick J McKibbin AO, FASSA
Centre for Applied Macroeconomic Analysis (CAMA) and
Centre of Excellence in Population Ageing Research (CEPAR)
Australian National University
Centre for Economic Policy Research (London)
and
The Brookings Institution, Washington DC

Presentation to NGFS workshop Singapore 26 April 2023

Two main issues

- What are the implications of climate change and the transition for inflation in the long term and over the policy-relevant horizon?
- What are the key modifications to CB models that are required to model the impacts of the transition to net zero? (in other words, with finite resources and competing demands, where should CBs be focusing their efforts)

Draws on

- McKibbin W. J., Morris, A., Wilcoxen P. J. and A Panton (2020) "Climate change and monetary policy: Issues for policy design and modelling" Oxford Review of Economic Policy vol 36, issue 3
- Jaumotte, F., Liu, W. & McKibbin, W. J. (2021). Mitigating Climate Change: Growth-friendly Policies to Achieve Net Zero Emissions by 2050. IMF Working paper wp2021195. Washington DC.
- Fernando R., Liu W. and W. McKibbin (2021) "Global Economic Impacts of Climate Shocks, Climate Policy and Changes in Climate Risk Assessment" CAMA working paper 37/2021
- McKibbin, W. and D. Vines (2023) "Longer-Term Structural Transitions and Short-Term Macroeconomic Adjustment: Quantitative Implications For The Global Financial System," Oxford Review of Economic Policy 9, 245–266.

Climate Change

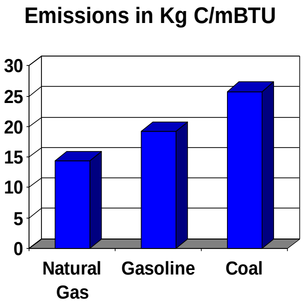
- Both the impacts of climate change (physical risks) and the policy responses to climate change (transition risks) are important for inflation and the operation of monetary policy

Key points

- Climate shocks (physical risks) have aggregate and sectoral-specific quantity and price consequences
  - Aggregate prices and relative prices change
- Different climate policies (transition risks) have different effects on inflation and output
  - Price trends/relative price trends/price volatility/potential output/aggregate demand

Climate Policy as a Supply Shock

- Expected impacts depend on policy design.
  - Stringency
  - Timing
  - Approach to carbon pricing (cap-and-trade vs. carbon tax vs. Hybrid)
  - Use of revenue
- Outcomes vary by sector, region, fuel
  - Carbon intensity
  - Elasticities



Types of Climate Policies

- Permit trading system
  - Emissions fixed; Carbon price market determined
- Carbon tax
  - Carbon price fixed; Emissions market determined
- Hybrid of long-term emissions trading with short-term carbon tax (CALM)
  - Short-term price fixed and long-term price market determined
- Regulatory Approaches

Implications of Climate policies for price volatility

- Carbon price/Energy price/aggregate price and relative price volatility are different under a permit trading system, a carbon tax and a Hybrid

Monetary Rules

- Potential targets:
  - Inflation
  - Price level
  - Nominal income/nominal growth
  - Henderson-McKibbin-Taylor Multifactor Rule
- Each approach uses different information and forecasts.
  - *How do targeting options compare in a carbon-constrained climate-disrupted world?*

Monetary Rules

- Most monetary rules handle demand shocks well
- Managing supply shocks involves more tradeoffs across inflation and output stability goals.
- **Climate change implies a world of greater supply shocks**.

Monetary Rules

- A key aspect of inflation targeting regimes is the forecast of inflation
- If inflation forecasts are poor, then the monetary regime’s credibility is undermined.
- Estimates of the output gap are a key input into inflation forecasts.
- The output gap is likely to become more uncertain and more difficult to measure and forecast in a climate-impacted world

Key issue for Inflation targeting

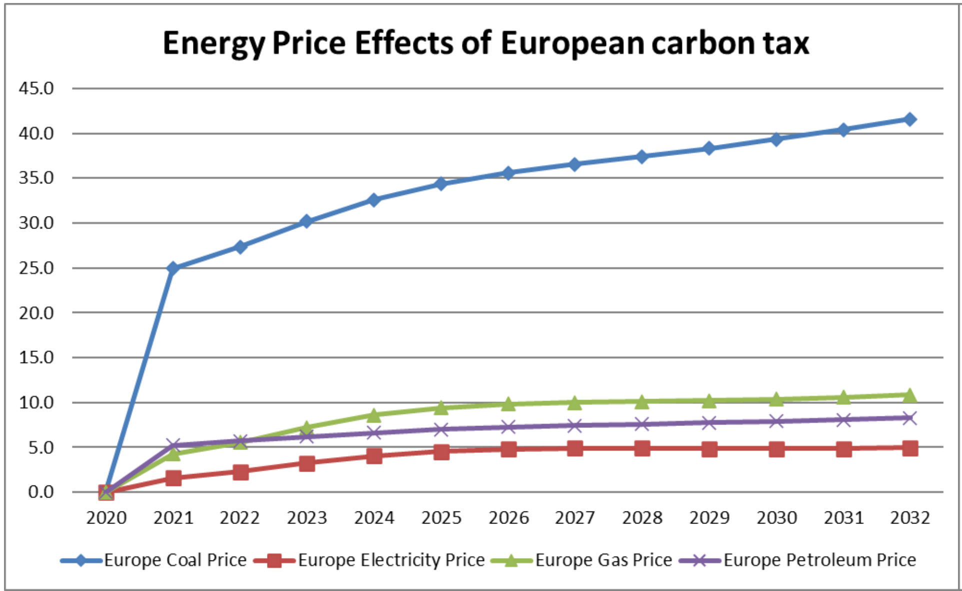
- All efficient climate regimes that price carbon have a rising carbon price to drive emissions lower over time
  - Underlying inflation will have a new trend
- Carbon price volatility is higher under a cap and trade policy than under carbon tax or hybrid regime.

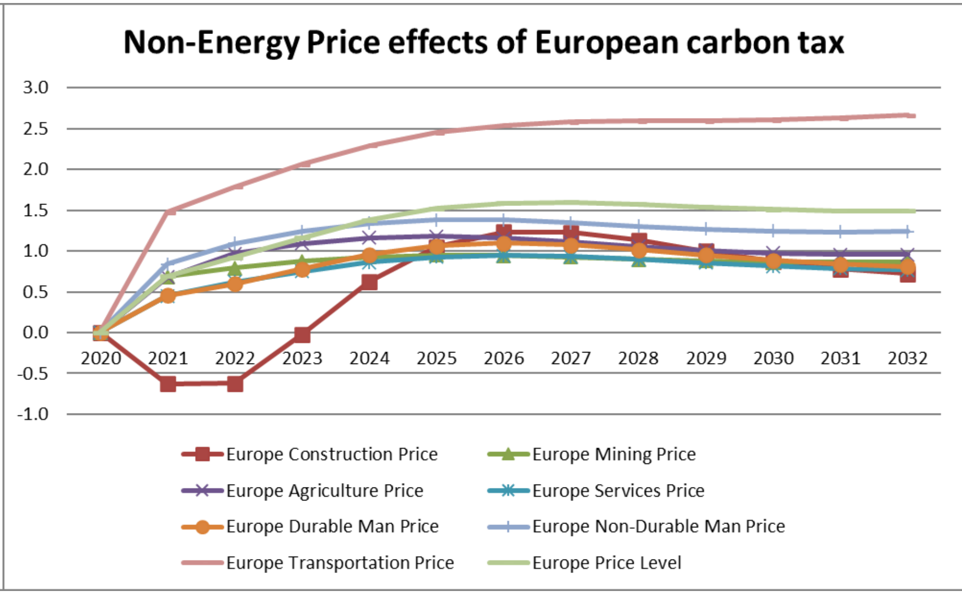
An example: Climate Policy in Europe

- McKibbin W., M. Konradt and B. Weder di Mauro (2022) “Climate Policies and Monetary Policies in the Euro Area“ in P. Hartmann and Schepens, G. (2022) „Beyond the pandemic: the future of monetary Policy“ Conference Proceedings European Central Bank 2021 Sintra Forum

- Euro countries implement a carbon tax in 2021 that starts at $50 euro per ton of CO2 and rises by 3% per year

Climate Policy in Euro Area (under MHS)

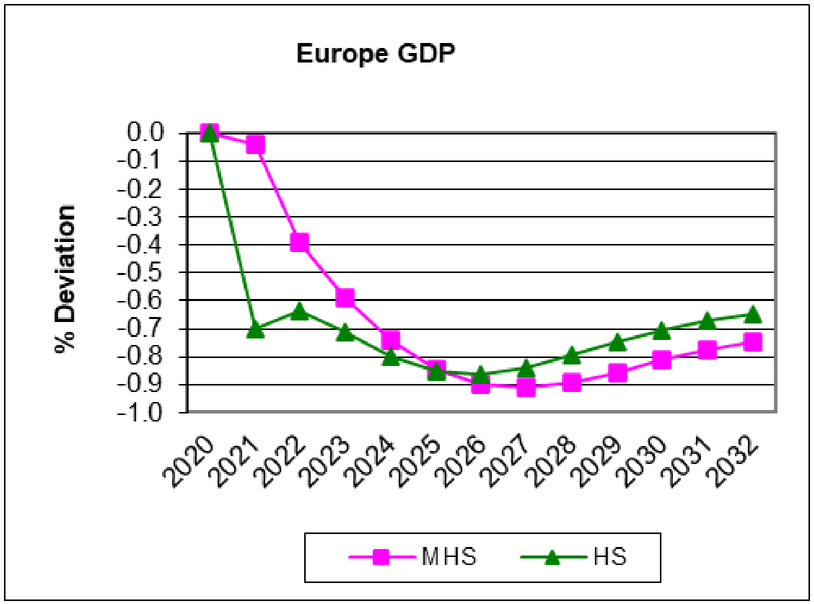


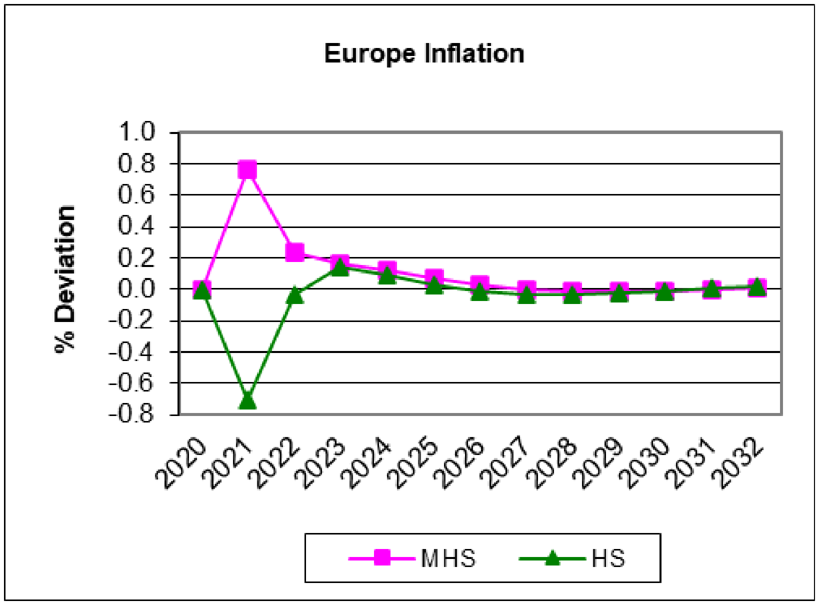


MHS is a modified Hartmann Smets Rule

Source G-Cubed Model Version GGG20N_v161

Climate Policy in Euro Area





MHS is a modified Hartmann Smets Rule
HS is Hartmann Smets Rule

$$i_t = i_{t-1} + 0.34 * (\pi_{t,t+1} - \bar{\pi}_{t+1}) + 0.4 * (g_{t,t+1} - \bar{g}_{t+1}) \qquad \text{HS} \qquad (1)$$

$$i_t = i_{t-1} + 0.5 * (0.34 * (\pi_t - \bar{\pi}_t) + 0.4 * (g_t - \bar{g}_t)) + 0.5 * (0.34 * (\pi_{t,t+1} - \bar{\pi}_{t+1}) + 0.4 * (g_{t,t+1} - \bar{g}_{t+1}) \qquad \text{MHS} \qquad (2)$$

Source G-Cubed Model Version GGG20N_v161

Model Needs for Central Banks

- Consistent macroeconomic framework with sectoral disaggregation
- Financial sector with a variety of assets
- Energy generation/distribution and use broken down by energy type
- A global model because a global problem that will need global policies that spillover between countries

G-Cubed Model

- McKibbin W and Wilcoxen P (2013), "A Global Approach to Energy and the Environment: The G-cubed Model" *Handbook of CGE Modeling*, Chapter 17, North Holland.
- McKibbin W. and P. Wilcoxen (1999) "The Theoretical and Empirical Structure of the G-Cubed Model" *Economic Modelling* , 16,
- Bertram C. Boirard A., Edmonds J., Fernando R., Gayle D., Hurst I., Liu W., McKibbin W., Payerols C., Richters O., Schets E., (2022) "Running the NGFS Scenarios in G-Cubed: A Tale of Two Modelling Frameworks", NGFS Occasional Paper, Banque de France.

Network of Model Users

- Used for policy analysis and scenario planning by governments, international agencies, corporations, banks, and academic researchers.

- Currently used by the Bank of Canada, European Central Bank, and Reserve Bank of Australia

- Scenarios used by the Australian Prudential Regularity Authority to stress test the Australian banking system for climate risk.

G-Cubed Model

- Global General Equilibrium Growth Model
- Hybrid of a dynamic stochastic general equilibrium (DSGE) model (used by central banks) and a computable general equilibrium (CGE) model.
- Inter-industry linkages, trade, capital flows, consumption, and investment.
- Annual macroeconomic and sectoral dynamics
- Captures frictions in labour markets and capital accumulation
  - Full employment in the long run but unemployment in the short run
  - Labor mobile across sectors but not regions

www.GCUBED.com