

How Does Climate Change influence the Design of Monetary Regimes?

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BASED ON

McKibbin W. J., Morris, A., Wilcoxon P. J. and A Panton “Climate change and monetary policy: Dealing with disruption”, Brookings Discussion Paper in Climate and Energy Economics, December 2017.

Climate Change

Both the **impacts of climate change** and **the policy responses** to climate change are important for monetary policy

Key points

- Climate shocks have aggregate and sectoral specific quantity and price consequences
- Different climate policies have different effects on inflation and output
 - » Price trends
 - » price volatility
 - » potential output
 - » aggregate demand

Climate Basics: Heterogeneous shocks from climatic disruption & ocean acidification

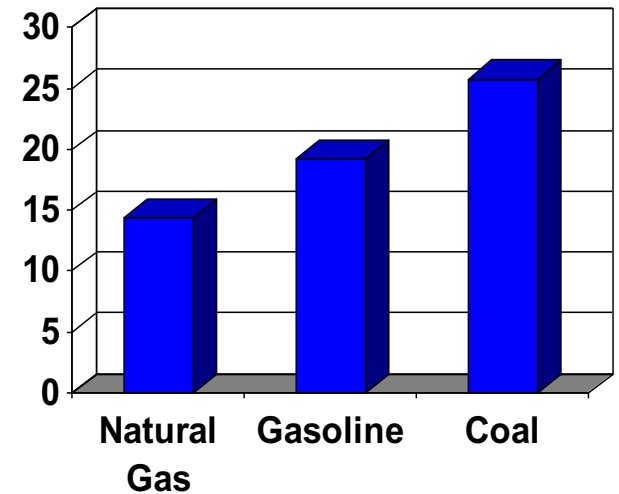
- Cities and facilities in low-lying/vulnerable areas
- Operations vulnerable to droughts or floods
- Disruption of resource inputs, production, markets
- Disruption to labor supply



Climate Policy Shocks

- 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

Emissions in Kg C/mBTU



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
 - » Short term price fixed and long term price market determined
- Regulatory Approaches

An example: a carbon tax

Carbon tax analysis using the G-Cubed Model

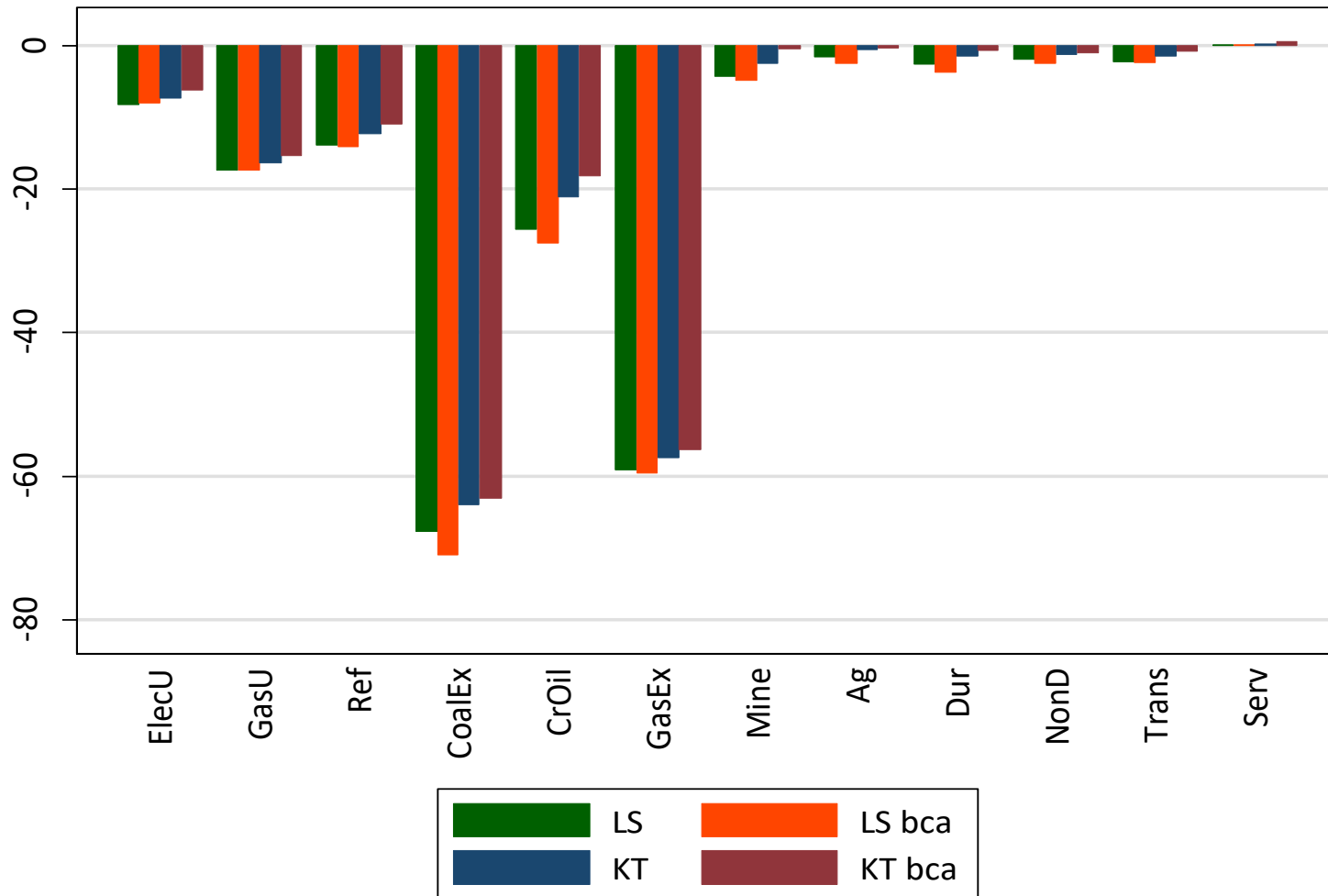
Fossil CO₂ tax starting at \$25/ton, rising at 5% real
Changes in output of each sector in 2035

- 2 assumptions about revenue
 - » LS lump sum rebate to households
 - » KT reduce tax rate on capital
- BCA (border carbon tax adjustment)
 - » No adjustment
 - » Adjustment (bca)

Carbon tax analysis using the G-Cubed Model

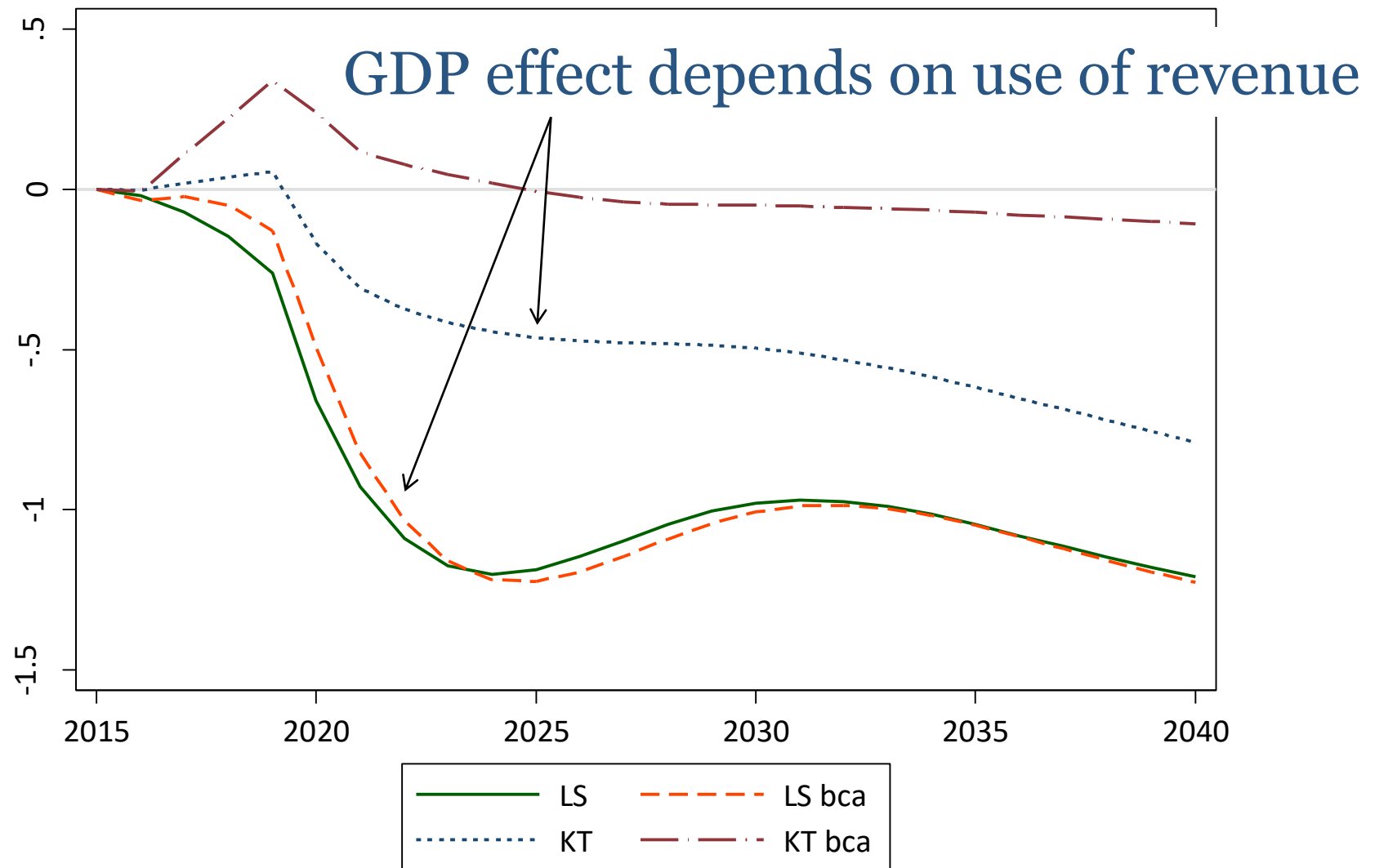
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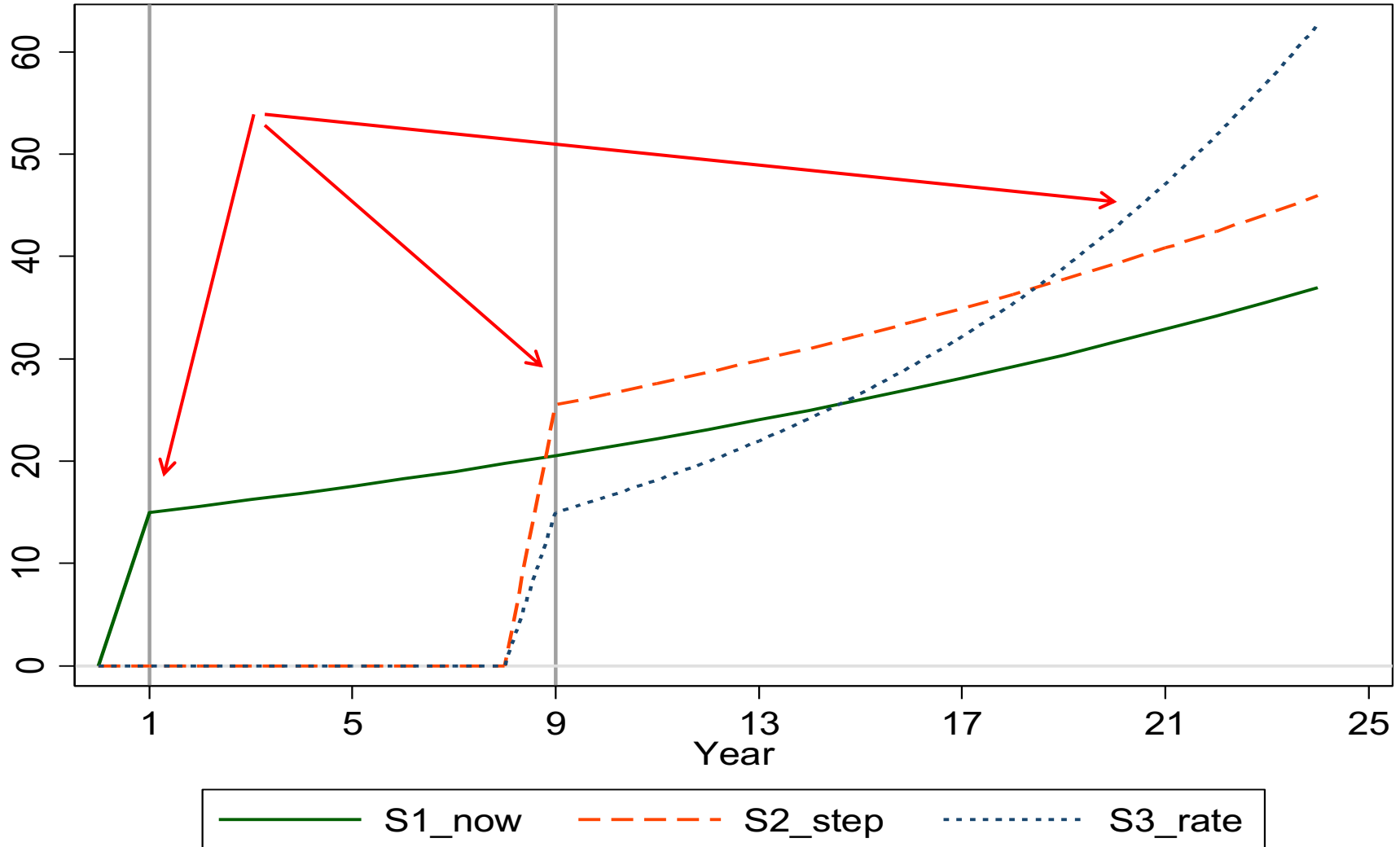
Source: McKibbin W. J., Morris, A., Wilcoxon P. J. and L. Liu (2018) "The Role of Border Adjustments in a US Carbon Tax", *Climate Change Economics* vol 9, no 1, pp 1-42.

Changes in Real U.S. GDP Relative to Baseline From Fossil CO₂ tax starting at \$25/ton, rising at 5% real



Source: McKibbin W. J., Morris, A., Wilcoxon P. J. and L. Liu (2018) "The Role of Border Adjustments in a US Carbon Tax", *Climate Change Economics* vol 9, no 1, pp 1-42.

CO2 tax rate must start higher or grow faster if policy is delayed



Source: McKibbin W. J., Morris, A., and Wilcoxon P. J. (2014) "The Economic Consequences of Delay in U.S. Climate Policy", Brookings Discussion Paper in Climate and Energy Economics, June 3..

Impact of a Carbon tax

- Carbon tax rising in real terms over time
- Trend GDP falls and economic slowdown during implementation
- Inflation rises due to higher energy prices
- Exchange rate depreciates in fossil fuel intensive economies due to a global reallocation of capital

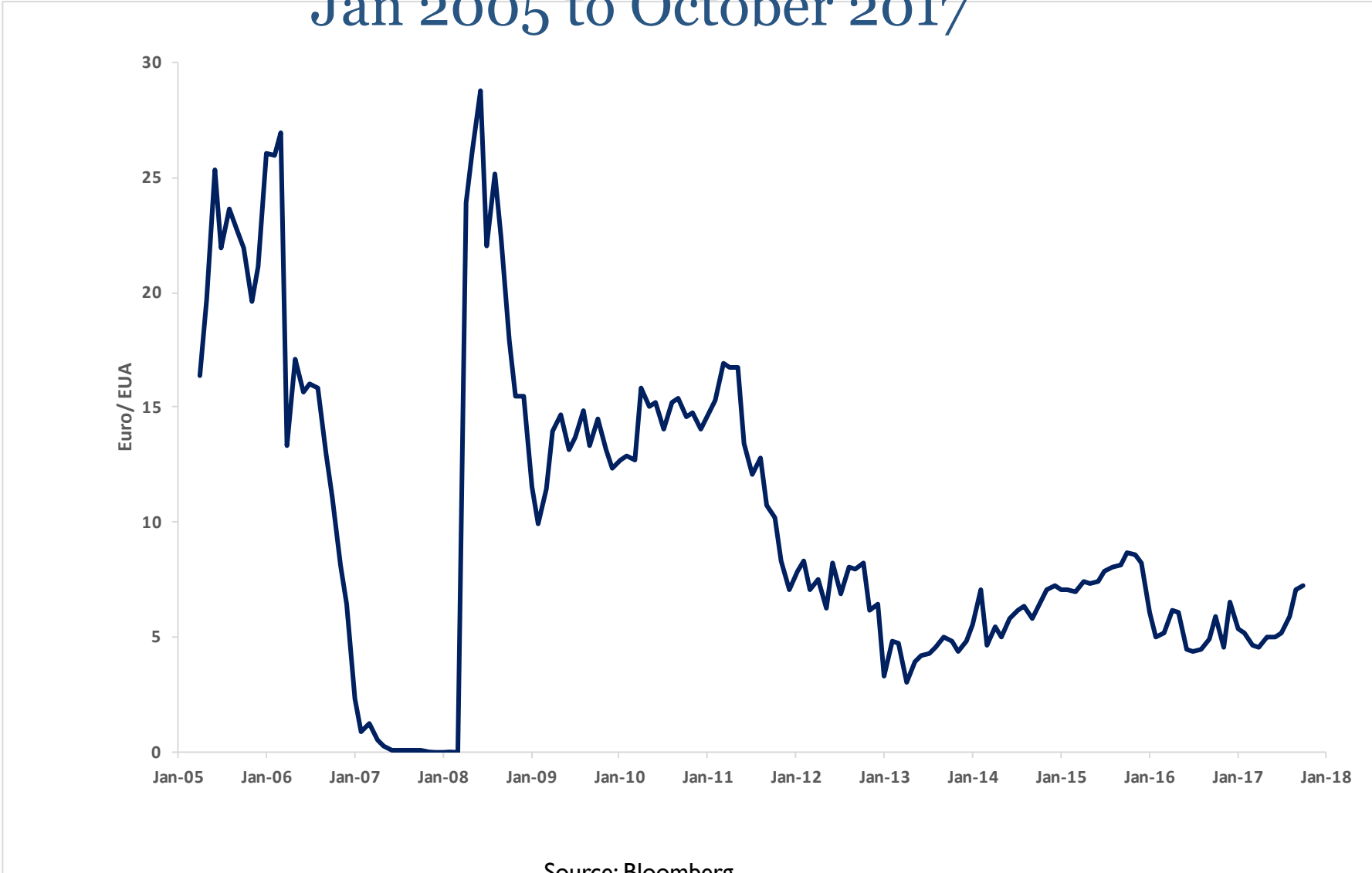
Other Climate Policies are Harder For Central Banks to Accommodate

- Emissions Trading
 - » Uncertain price signal owing to uncertain cost of abatement (stringency) & variation in economic growth
- Hybrid Policy
 - » Better than ETS
 - » Same predictability in short run as a carbon tax
- Regulatory/Subsidy/Standards Policy
 - » Most difficult for a given level of environmental performance
 - » Effects on output and prices would be opaque and hard to predict

Energy price volatility under
different climate policy regimes
differ

Futures price of allowances in EU Emissions Trading System

Jan 2005 to October 2017



Source: Bloomberg

Implications for Monetary Policy

- Complex Supply shocks
- Estimation of output gaps more difficult
- climate policies likely to cause
 - » Increase volatility in energy prices
 - » Trend change in energy prices
- Inflation forecasting likely to be more difficult

Central Bank Response

- Strict inflation target (SIT)
 - » Raise interest rates
 - » Slow growth
 - » Appreciate exchange rate, depress exports
 - » Reduce inflation, but worsen output decline
- Flexible inflation target (FIT)
 - » Moderate interest rate increase but need to work out shock
 - » But must detect carbon tax signal in noise of baseline
- Price level target (PLT)
 - » Tighter policy to have deflation so price level returns to base
- In SIT, FIT, and PLT, the central bank would worsen the impact of the shock on economic activity.

Central Bank Response

- Henderson-McKibbin-Taylor Rule (HMT)
 - » Balanced reaction to output and inflation effects
 - » small change in interest rates
 - Less output decline
 - Higher inflation
 - » Forecast of output gap is important
- Nominal Income Targeting (NIT)
 - » Balanced reaction to output and inflation effects
 - » small change in interest rates
 - Less output decline
 - Higher inflation
 - » Only relies on forecast of nominal income

Conclusion

- Central banks should expect more and larger shocks.
- Climate policy design that induces predictable and transparent price signals (like a carbon tax or a Hybrid) makes monetary policy response more transparent.
- Nominal Income Targeting would be better than inflation targeting because
 - » it avoids the need for a forecast of potential output
 - » does not require understanding precise nature of the climate-related shock
 - » It still anchors inflationary expectations to within a band
- A great deal more empirical research is needed

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