

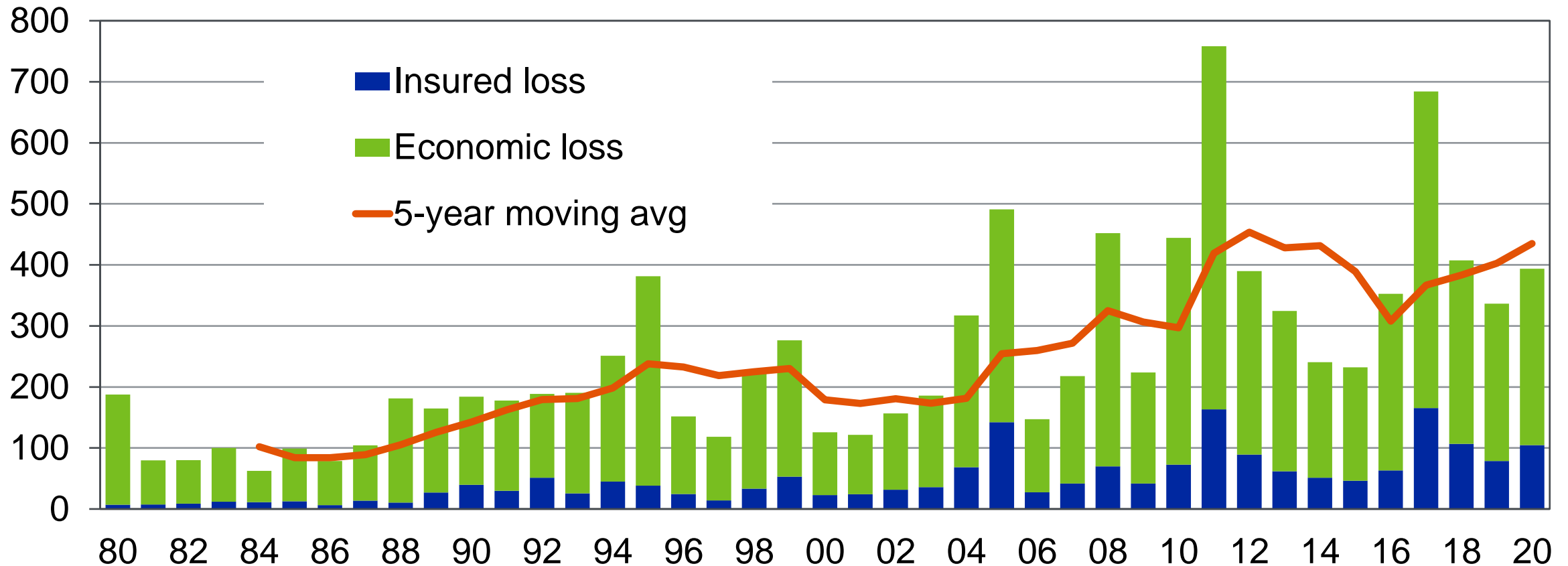
# Bank of England's CBES Climate Stress Test

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# The Regulatory Landscape

# Mounting Costs From Climate Change

Global losses due to natural disasters, Bil 2020\$



Sources: Reinsurance Association of America, AON, Moody's Analytics

# Regulatory Environment

- » Climate risk stress testing has begun. The Hong Kong Monetary Authority (**HKMA**) announced a climate risk stress test in April. The Bank of England (**BOE**) has just released its first climate risk stress test. More regulators will follow suit.
- » Network for Greening the Financial System (NGFS) and Task Force on Climate-related Financial Disclosures (TCFD) are leading voices for a call to action in the financial system.
  - **NGFS** is a group of over 35 central banks and regulatory agencies worldwide established at the Paris “One Planet Summit” in December 2017. BoE, ECB/EBA, Banque De France, The Peoples Bank of China, EIOPA, the FED, etc.
  - **TCFD** is a taskforce set up by the Financial Stability Board, comprised of over 785 influential global organizations.

## **UK- BoE/PRA**

- SS3/19: Enhancing banks’ and insurers’ approaches to managing the financial risks from climate change April 2019
- The 2021 biennial exploratory scenario (BES) on the financial risks from climate change, BoE Discussion Paper 2019 & 2020. Three scenarios corresponding to NGFS scenarios.
- Climate Change Committee/Climate Change Act

## **US-Fed**

- The Fed joined NGFS in November 2020.
- Climate becomes mentioned in the Fed’s Financial Stability Report, November 2020
- Statement by Governor Lael Brainard
- September 2020 – an advisory panel to the Commodity Futures Trading Commission released a report ‘Managing Climate Risk in the U.S. Financial System.’

# Expect More Stress Tests, including the Fed Eventually

## 'No place to hide': Central banks ramp up scrutiny of climate risk

The world's central bankers could change the direction of bank lending.



The U.S. central bank isn't conducting climate analysis, but "there's a lot to like about climate stress tests," which are emerging as a principal tool for assessing risk, Jerome Powell said. | Susan Walsh-Pool/Getty Images

By LORRAINE WOELLERT  
06/08/2021 10:13 AM EDT



As shareholders celebrate [long-fought climate wins](#) at some of the world's largest corporations, a potentially more powerful financial movement is under way that could shift trillions of dollars in capital.

The role of greenhouse gas emissions in debt markets is on the verge of exploding as central banks write climate risk into bank oversight and rethink their own bond portfolios.

“We don’t have a secondary mandate to support the economic policy of the government as many European banks do. So we view climate-related financial risk as a risk that falls under our existing mandates. There are a lot of reasons to think that climate stress and climate scenario analysis can contribute in a very positive way. It can be used to illustrate what different sets of government policies might bring forth in terms of results for climate, so there’s a lot to like.”

JEROME POWELL

Federal Reserve Chair

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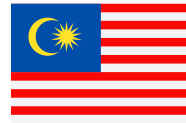
## Why Climate Risk Scenarios?



Maybe winter  
*isn't* coming...

# Climate Risk Scenarios Motivation

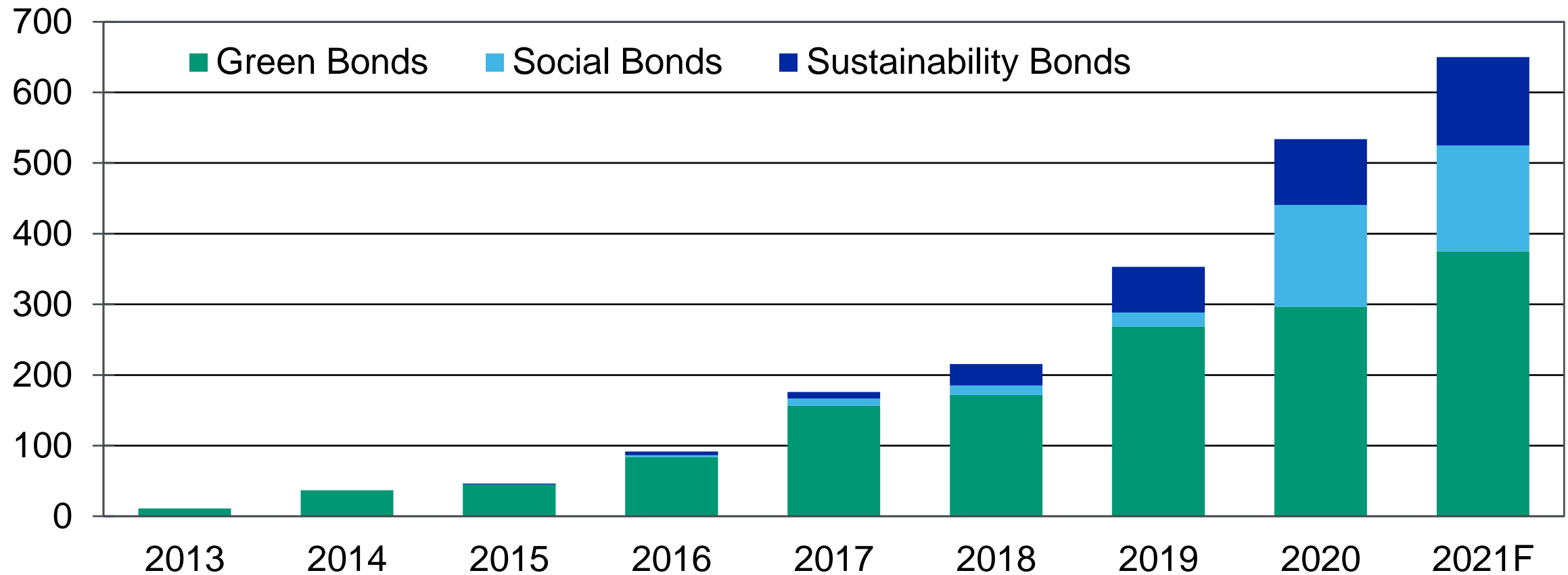
- » Climate risk is becoming more evident, and governments around the world are taking action.
- » Central banks and regulators urging financial institutions to take climate risk into account when calculating losses and making business decisions. Pilot stress tests kicked off this year.
  - Hong Kong Monetary Authority
  - Monetary Authority of Singapore
  - Bank of England
  - Bank of France
  - Upcoming in 2022: European Banking Authority, BoE again, Brazil, Canada, Australia Central Banks?





# Investors Are Demanding ESG Options

Annual issuance, \$ bil



Sources: Moody's Investors Service, Climate Bonds Initiative and Dealogic

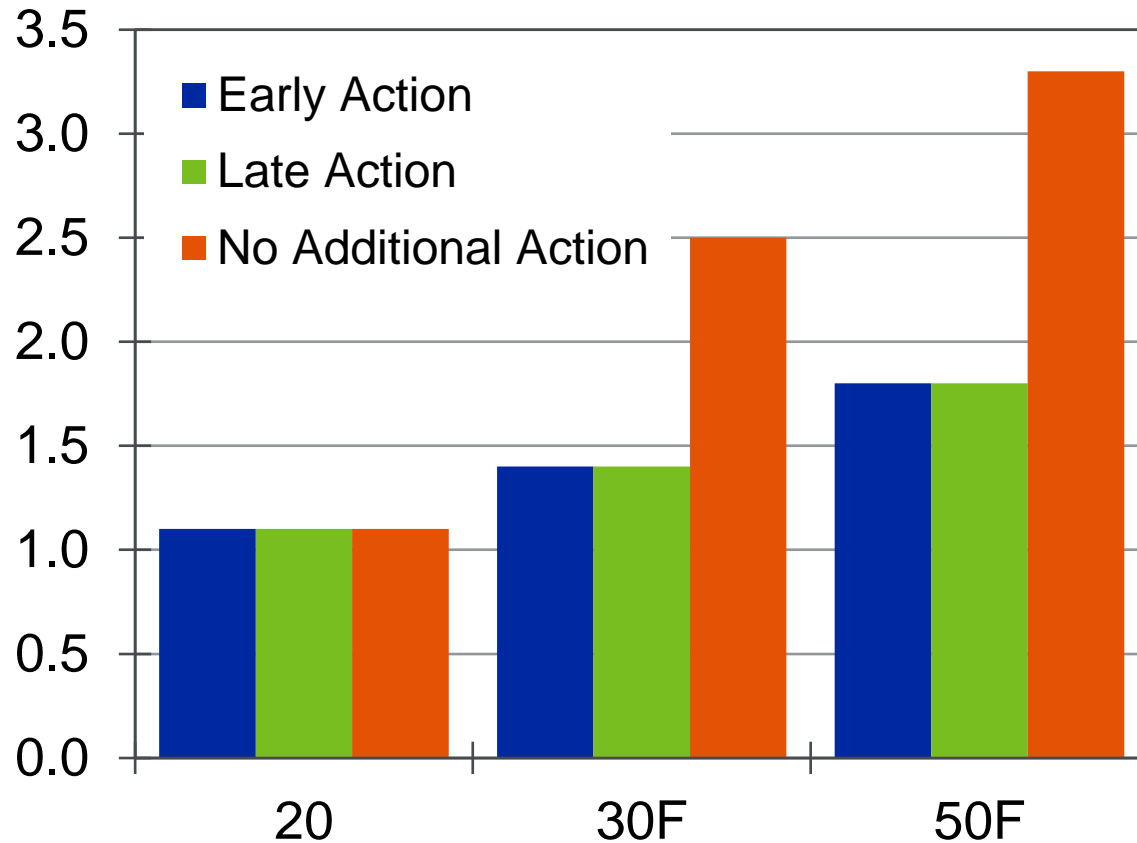


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## BOE's Climate Biennial Exploratory Scenarios (CBES)

# Paris Climate Targets Reached...

Change in global temperature relative to pre-industrial levels, °C

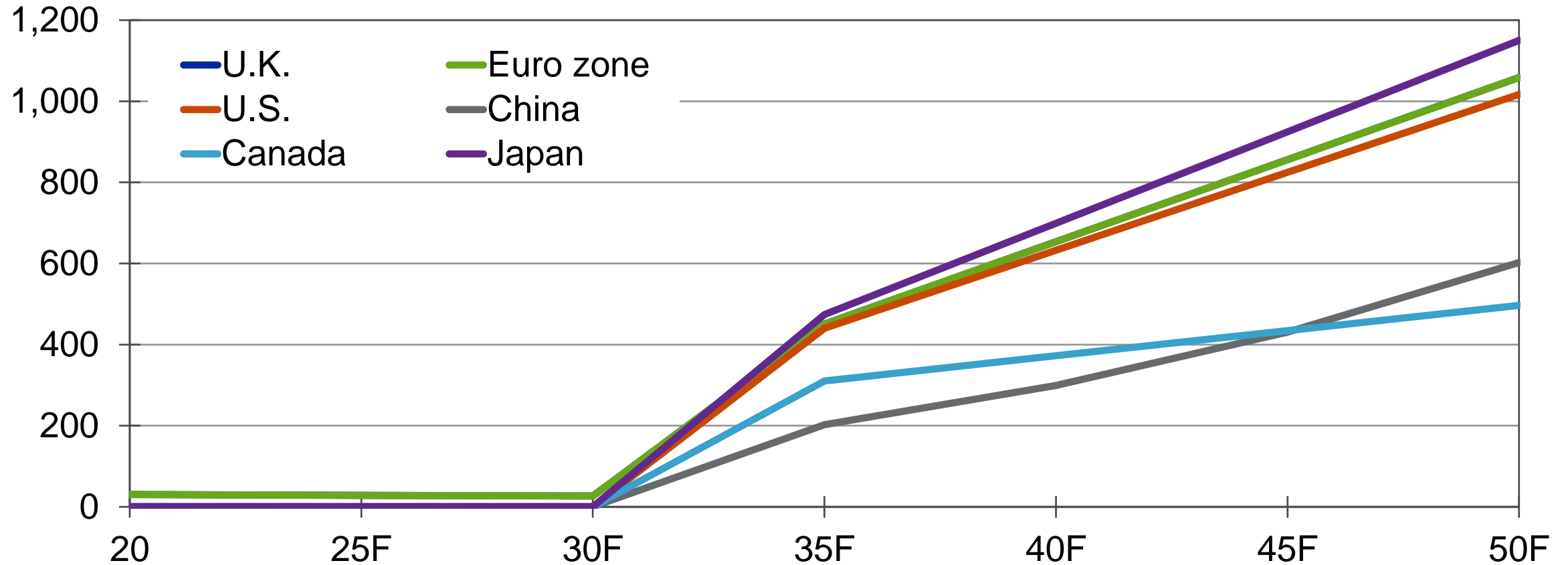


Sources: BoE, Moody's Analytics

- » 3 climate risk scenarios based on NGFS
  - » Early policy action: Net-zero CO<sub>2</sub> emissions by 2050. Transition begins in 2021
  - » Late policy action: Net-zero CO<sub>2</sub> emissions by 2050. Transition begins in 2031
  - » No additional action: No climate policies except those implemented before 2021
- » Early and late policy action feature massive carbon taxes to achieve Paris temperature goal
- » No additional action features limited transition risk and maximum physical risk
- » Physical risk that are expected to materialize in 2050-2080 are assumed to occur on day 1 of the no additional action scenario

## ...Through Substantial Policy Action

Carbon price, 2010 \$ per metric ton



Sources: BoE, Moody's Analytics

# Assessing the CBES Scenarios

## Pros

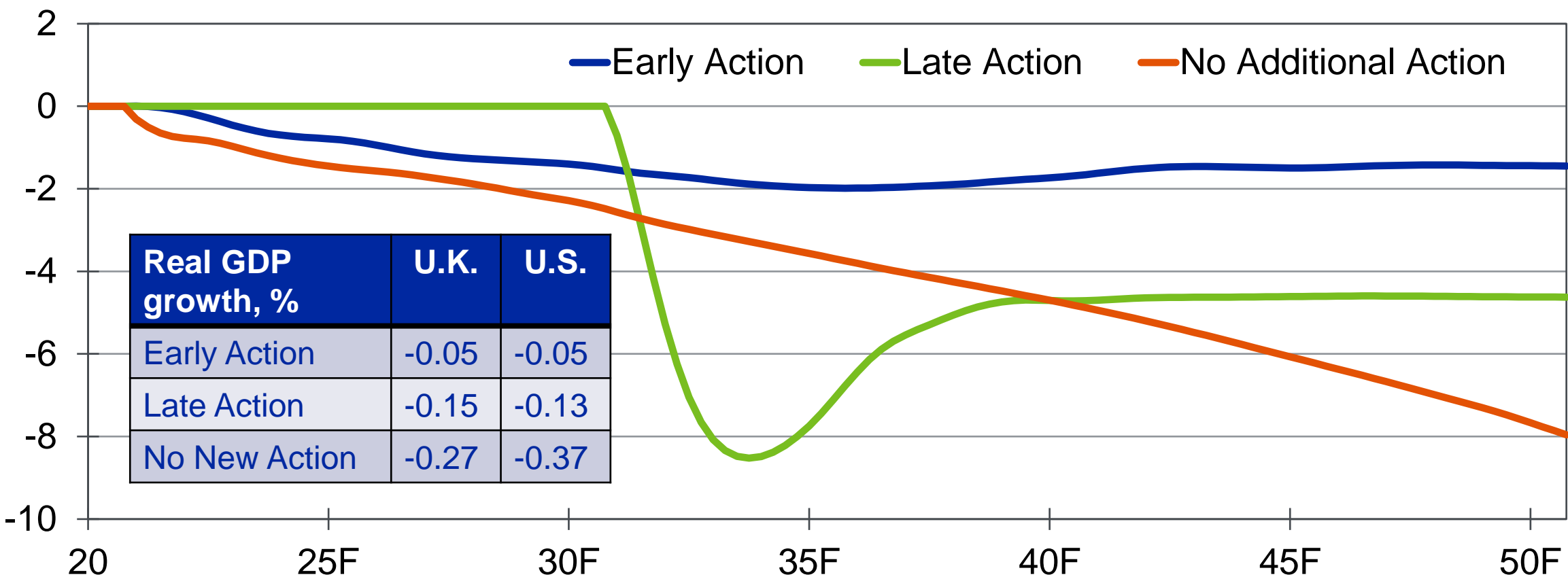
- » Mobilizes action towards financial industry quantification of climate risks
- » The most comprehensive and thoughtful approach to climate risk stress testing to date
- » Extensive amount of macroeconomic, financial, physical and transition forecasts provided limits ambiguity
- » Creative approach to quantifying long-term physical risks

## Cons

- » 2050 forecast horizon is too short to adequately assess climate change risks
- » Less variable coverage than provided by NGFS
- » Subject to misinterpretation...assumptions vulnerable to challenges

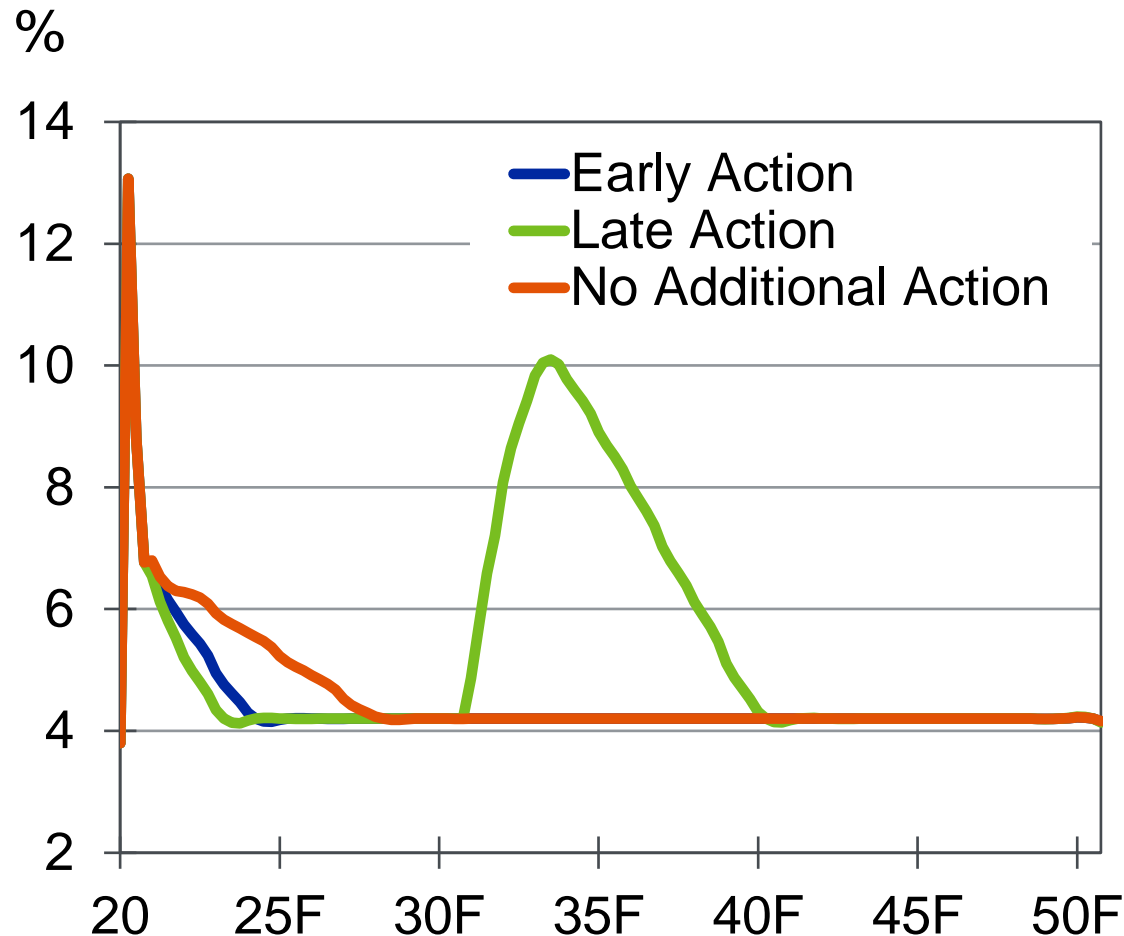
# BOE: Act Early And Often

U.K. GDP, cumulative decline from counterfactual scenario, %



Sources: CBES, Moody's Analytics

# U.S. Unemployment Rate Comparison



- » CBES assumptions
- » Persistently high unemployment in the no additional action scenario at the beginning of the forecast horizon
- » Late action scenario causes a severe recession
- » Scenarios do not feature hysteresis

Sources: CBES, Moody's Analytics

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Expanding the CBES



# What Did We Do And Why Did We Do It?

## » **Quarterization**

- » Quarterized all annual data provided by the BOE

## » **GDP disaggregation**

- » Created GDP pathways for every country in every scenario

## » **Carbon pricing and energy composition**

- » Supplemented the CBES scenarios with NGFS carbon price and energy composition data

## » **Gross Value Added methodology**

- » GVA forecasts incorporate both model equations and BOE input

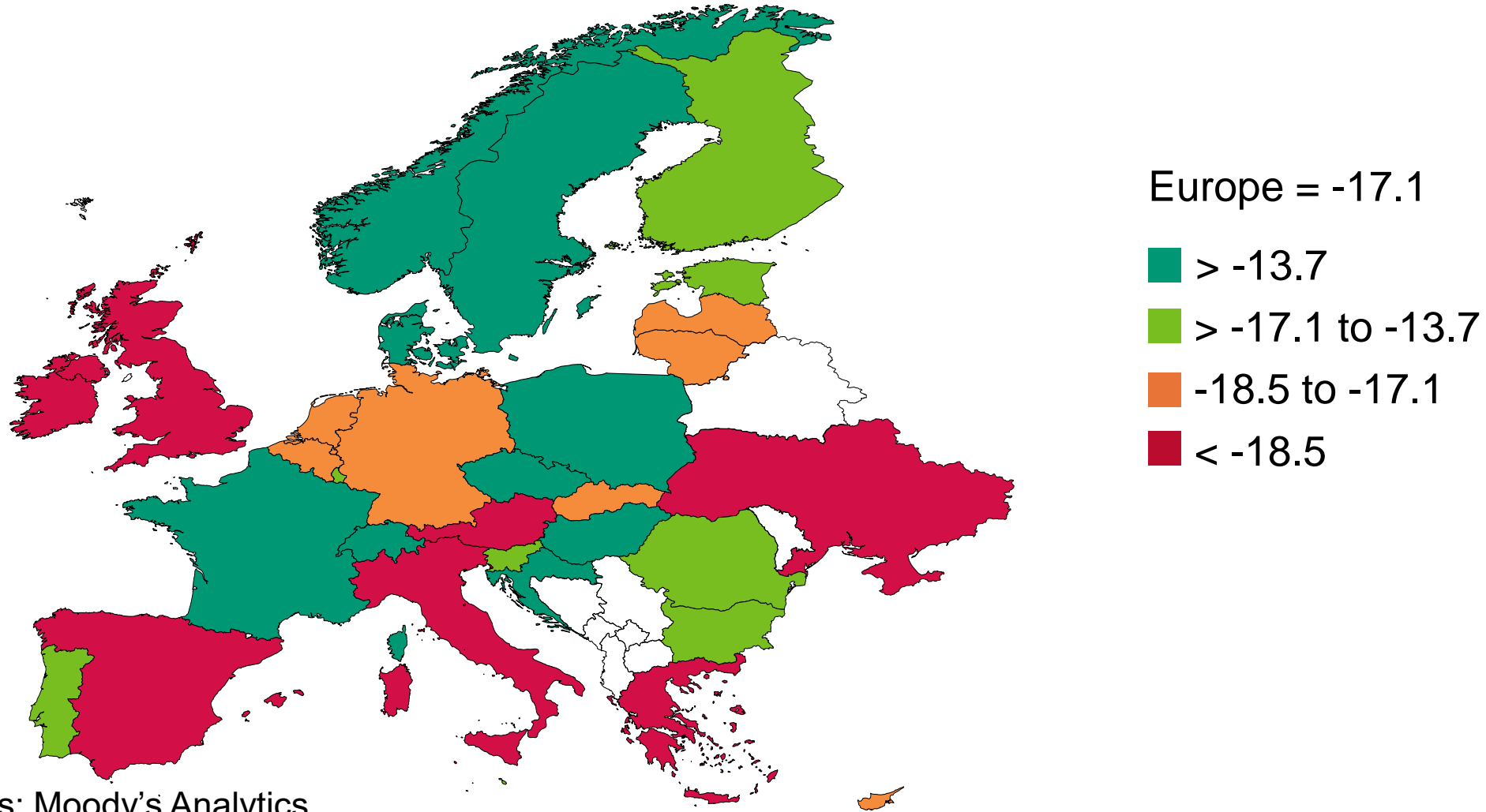
## » **Inflation methodology**

- » Supplemented the CBES scenarios with NGFS data, smoothed NGFS data

## » **Financial market variable expansion**

- » Sectoral equity indices, corporate spreads, sovereign CDS, swap rates, fx rates

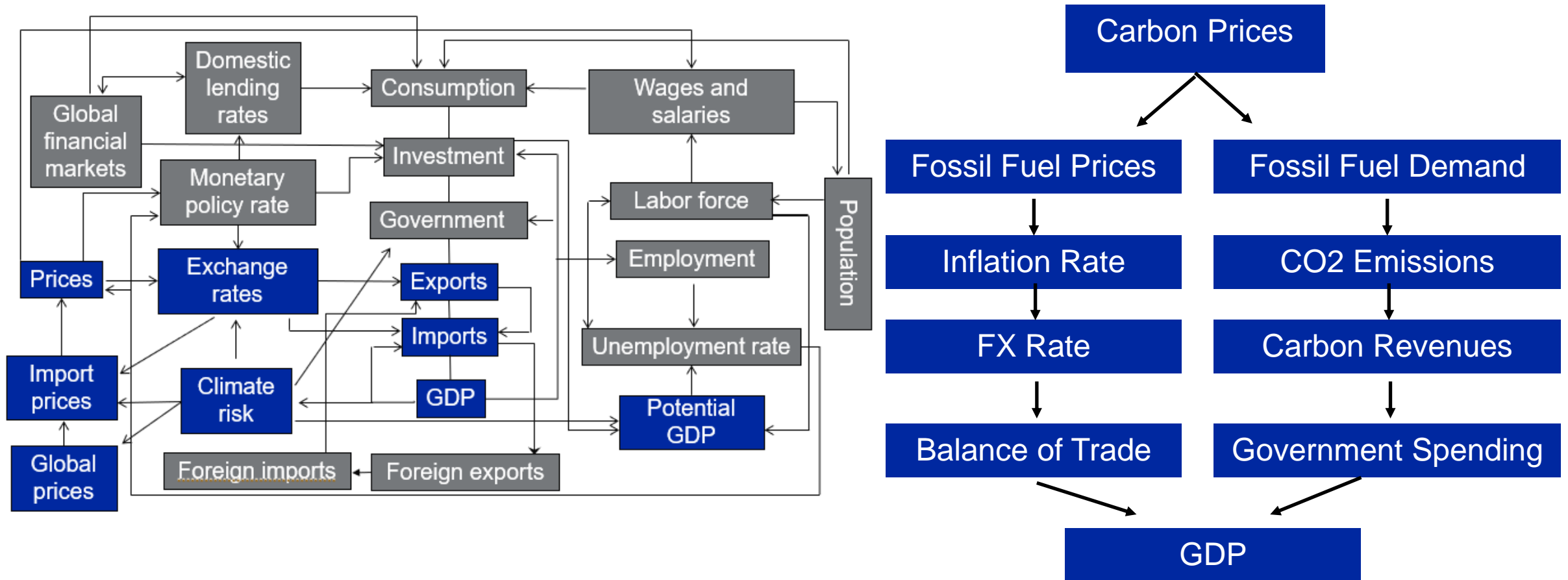
## Real GDP, % Decline, No Additional Action Scenario, 2050



Sources: Moody's Analytics

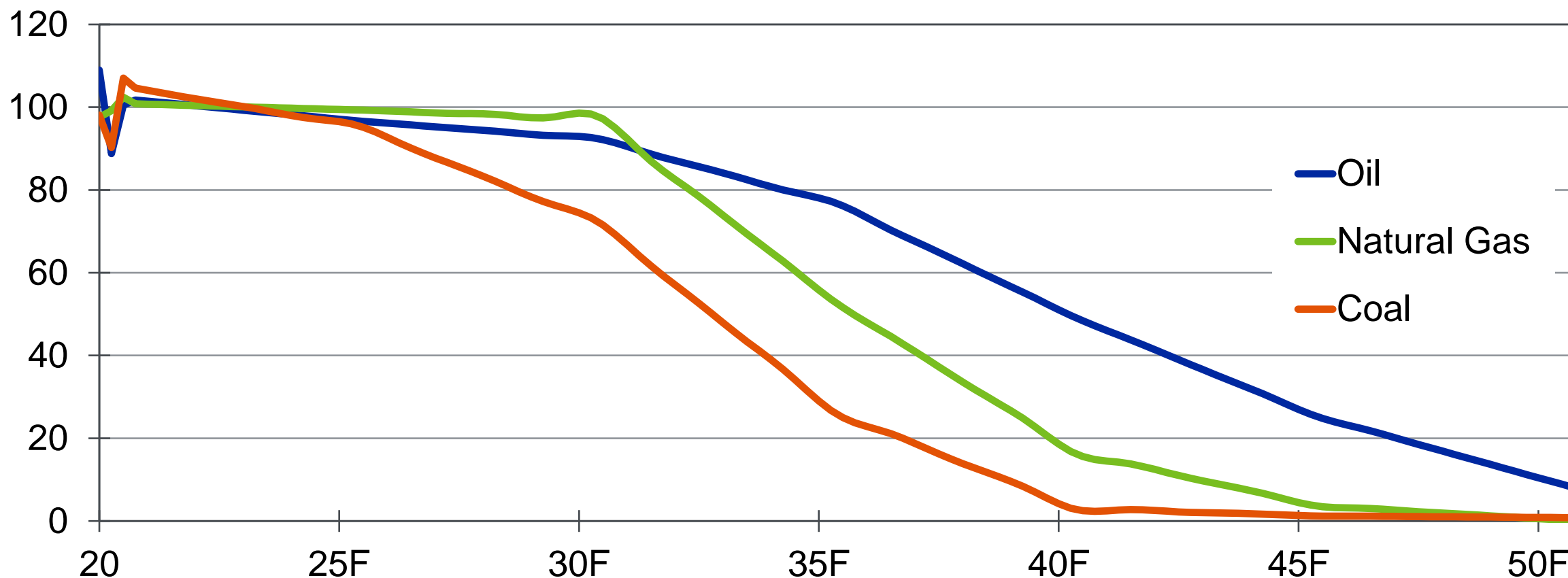
# Moody's Analytics Enhanced Global Macroeconomic Model

Transition risk integrated via carbon pricing



# Aggressive Carbon Pricing Reshapes the Economy

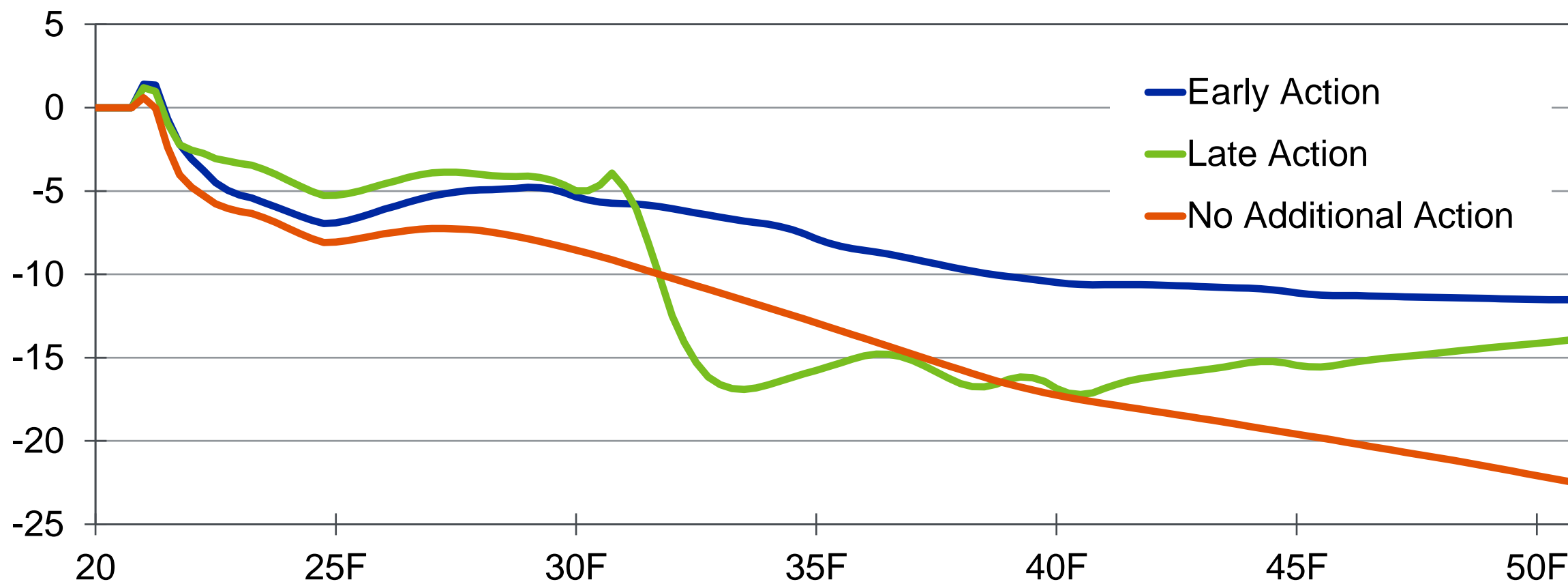
U.S. energy consumption, 2020=100, late policy action scenario



Sources: CBES, NGFS, Moody's Analytics

# Early Action Limits Manufacturing Losses

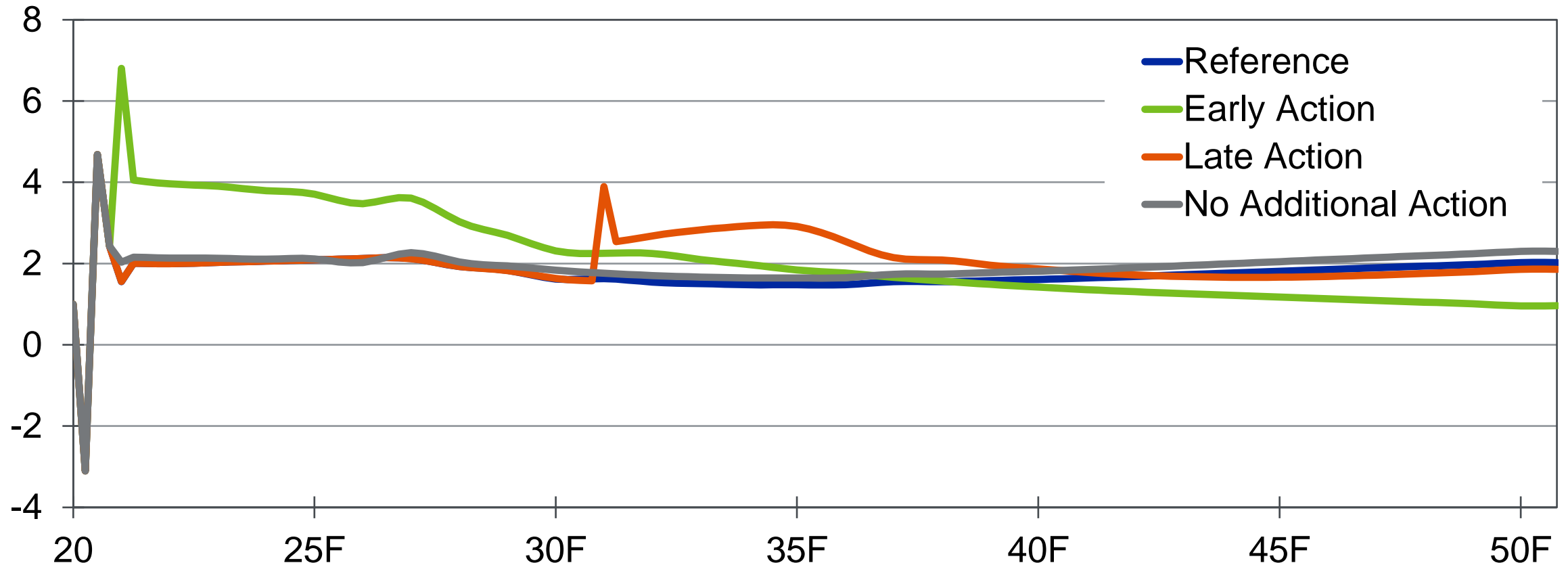
Germany, GVA in manufacturing, cumulative decline from counterfactual scenario, %



Sources: CBES, Moody's Analytics

# What Would The Fed Do?

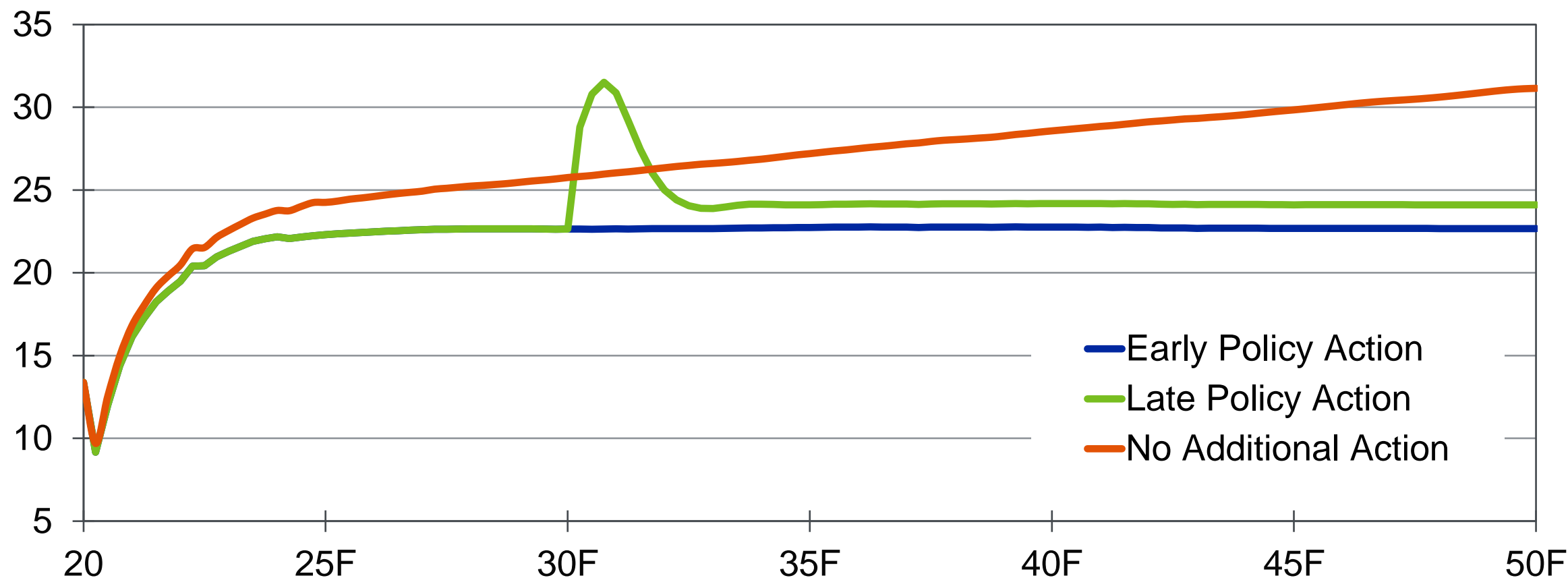
U.S. consumer price index, smoothed, annualized % change



Sources: BoE, Moody's Analytics

# Early Policy Action Limits Financial Stress

U.S., 5-yr Treasury CDS, bps



Source: Moody's Analytics



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What's Next

# Economic Climate Scenarios Roadmap

Program Milestones: Phase 1			
Description	Target Date	Status	Comments
RCP climate risk scenarios	July 2019	Complete	Chronic physical risk only through 2030
NGFS Phase 1 climate risk scenarios	December 2020	Complete	Prototype climate risk scenarios
HKMA macroeconomic climate risk scenarios	April 2021	Complete	Includes climate modules for 7 countries
Climate modules completed for 12 countries	May 2021	Complete	Climate models completed and imbedded in Global Macro model for Tier 1 countries
Climate modules completed for 15 countries (+3)	June 2021	Complete	Climate models completed and imbedded in Global Macro model for Tier 1 & 2 countries
BOE's CBES macroeconomic climate risk scenarios	June 2021	Complete	Global coverage with climate modules for 15 countries
Climate modules completed for 22 countries (+7)	September 2021	Not Complete	Adds coverage for 19 of the top 24 CO2 emitters
NGFS Phase 2 Climate Risk scenarios + continuous updates	September 2021	Not Complete	<ul style="list-style-type: none"> <li>This will serve as our flagship climate risk scenario offering. 2 updates per year.</li> <li>Other scenarios available as custom consulting</li> </ul>
Climate modules completed for 28 countries (+6). and regularly updated	March 2022	Not Complete	Expands country coverage to cover 80% of global CO2 emissions.

# Acronym Key

- » BOE = Bank of England
- » HKMA = Hong Kong Monetary Authority
- » NGFS = Network for Greening the Financial System
- » GVA = Gross Value Added
- » CBES = Climate Biennial Exploratory Scenario
- » TCFD = Task Force on Climate-related Financial Disclosures
- » RCP = Representative Concentration Pathways
- » IAM = Integrated Assessment Model
- » NiGEM = National Institute Global Econometric Model



Questions?

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