

CLIMATE CHANGE AND CENTRAL BANKING

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Roadmap

- I. The role of central banks w.r.t. climate change
 - Discussion based on the documents
 - A) Characteristics of the ECB mandate
 - B) Arguments in favor of and against central banks tackling climate change issues
- II. A central bank's potential actions regarding climate change
- III. A focus on stress-testing
 - Stress-tests
 - The BdF exercise
 - The ECB exercise
- IV. Inflation and low carbon transition

Should central banks act to alleviate climate change? If yes, how?

Documents:

- ⌘ *Treaty of the functioning of the European Union*, Official Journal of the European Union, October 2012
- ⌘ The ECB's monetary policy statement, July 2021
- ⌘ ECB presents action plan to include climate change considerations in its monetary policy strategy, Press release, July 2021
- ⌘ Statement on Longer-Run Goals and Monetary Policy Strategy, FOMC, January 2022
- ⌘ Schnabel Isabel, "When markets fail – the need for collective action in tackling climate change", speech, September 2020 (+ slides)
- ⌘ Cochrane John, "Challenges for central banks – climate change", speech/blog post, October 2020
- ⌘ Mersch Yves, "Climate change and central banking", speech, November 2018

I. Questions:

A) What are the characteristics of the ECB's mandate?

B) What are the arguments in favor of and against central banks tackling climate change issues? What can a central bank do and not do?

I. A) What are the characteristics of the ECB's mandate?

Maintaining price stability:

- Article 127:
 - “Define and implement the monetary policy of the Union”
 - “act in accordance with the principle of an open market economy with free competition”
 - Primary objective: maintain price stability
 - Measured by the Harmonised Index of Consumer Prices (HICP)

Monetary policy horizon: medium-term (3 to 5 years)

I. A) What are the characteristics of the ECB's mandate?

Secondary objective:

“Without prejudice to the objective of price stability, [...] support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union”

- Monetary policy strategy review in 2020-2021:
 - Introduction of environment and climate change
 - (Symmetry of inflation target)
- Monetary policy statement, as of Jan. 2022:
 - “These objectives include balanced economic growth, a highly competitive social market economy aiming at **full employment** and **social progress**, and a high level of protection and improvement of the quality of the **environment**.”
 - “Within its mandate, the Governing Council is committed to ensuring that the Eurosystem fully takes into account, in line with the EU’s climate goals and objectives, the **implications of climate change and the carbon transition** for monetary policy and central banking.”
 - **Climate-related action plan**

I. A) What are the characteristics of the ECB's mandate?

Independence:

- Article 130:
“not seek to influence the members of the decision-making bodies of the European Central Bank”
- Article 282:
“it shall be independent in the exercise of its powers and in the management of its finances”

Members of the Executive Board: non-renewable term of 8 years.

Governing council: includes governors of NCB

I. A) What are the characteristics of the ECB's mandate?

Objectives of the FOMC:

- Strategy review in 2019-2020
- Price stability and employment symmetric objectives
 - “statutory mandate from the Congress of promoting maximum employment, stable prices, and moderate long-term interest rates”
- Flexible average inflation targeting:
 - “achieve **inflation that averages 2 percent over time**, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time.”
- No mention of climate change or environment.

FOMC: 7 members from the Board, the president of the FRB NY + 4 other FRB presidents (one year terms, rotation)

Members of the Board: non-renewable term of 14 years.

Chair of the Board: term of 7 + 4 years

I. B) What are the arguments in favor of and against central banks tackling climate change issues?

Mandate

Against:

- No clear **mandate**. Climate change is on the *political* agenda.
- Climate change comparable to any other political causes:
 - To be dealt with by elected politicians
 - Risk of opening the door to political pressures => loosing independence?
- Physical risks fall on insurers, and they are excluded from the ECB's mandate.

In favor:

- **Support general economic policies** in the Union.
- EU has passed some legislation that could justify ECB's climate action.
- Means ECB should only follow policies decided by EU?

I. B) What are the arguments in favor of and against central banks tackling climate change issues?

Monetary policy

Against:

- Think of consequences: CO2 criterion for asset purchases ? then what about government bonds? Defund carbon-intensive EU countries?
- **Timing mismatch** (Mersch):
 - Short-term: change in climate risks' probability
 - Medium-term: climate disasters impact very limited in advanced economies
 - Long-term impacts: beyond monetary policy's timing, very hard to identify

Neutral:

- Depends on how and whether climate risks may affect medium-term inflation dynamics (NGFS)
- CB cannot ignore climate risk (Schnabel)
- Possibility of tipping points in the medium run
- More research underway

I. B) What are the arguments in favor of and against central banks tackling climate change issues?

Monetary policy and portfolio management

Against:

- Use of tools needs to be “necessary, suitable and proportionate”
- Respect open market economy with **free competition**
- No portfolio adjustment possible, cannot focus on green bonds
akin to industrial policy!
threatens **independence** from political bodies
- Asset purchases for monetary policy:
calibrated to **reach maximum impact** on output and inflation
So need to touch wide range of economic sectors
- Disclosure obligations may then bring boycott and defund => risky
- Big **measurement issues**:
Carbon intensity of industries?
What is a green project?

I. B) What are the arguments in favor of and against central banks tackling climate change issues?

Monetary policy and portfolio management

In favor:

- Adjustment already started for private portfolios
- **Measurement issues:** Development of new indicators, improvement of disclosure and reporting (following EU policies)
- **Socially Responsible Investment**

Done by many NCB in Europe

Pension funds

Third party portfolios

BdF announced exit from fossil fuel energy assets by 2024

I. B) What are the arguments in favor of and against central banks tackling climate change issues?

Financial stability

Against:

- **No uncertainty** and financial risk in the short- to medium-run (Cochrane)
- ECB is not a regulator, the EBA is. ECB just makes sure the rules are respected, so they will adjust if the regulation is adjusted.
- Systemic risk from climate change is just an excuse to justify central bank's involvement.
- **Lack of objective measure of market failures**
In general central banks not looking for market failures.

In favor:

- Answer to **market failure**, climate risks are mispriced (Schnabel)
Informational market failures : Lack of granular data, lack of clear definitions, risk of greenwashing, insufficient incentives.
Externalities and tail events mispriced: no common price for CO2 emissions (despite ETS), suboptimal capital allocation
- **Exploratory scenarios**
DNB stress-test. BdF climate scenarios. collaboration with banks and insurers. ECB scenarios

Further points for today

II. A central bank's potential actions regarding climate change

III. A focus on stress-testing

- Stress-tests
- The BdF exercise
- The ECB exercise

IV. Inflation and low carbon transition

II. A central bank's potential actions regarding climate change

Sources: NGFS recommendations, ECB board members speeches, ECB action plan

Research to deepen our understanding (NGFS)

- Impact on **ability to reach price stability** objective
 - Whether and how climate may affect inflation dynamics
 - Impact on natural interest rate and policy space (higher precautionary savings? Higher investment and productivity growth? Opposite effects)
 - Impact on monetary policy transmission and effectiveness
 - Impact on choice of monetary regime (horizon, target): Fratzscher et al. show that inflation targeting absorbing shocks due to natural disaster.
- Understand **more general effects** on the economy
 - Improve modeling toolkit

II. A central bank's potential actions regarding climate change

Monetary policy

- Improve macroeconomic modelling, assess implications for monetary policy transmission (ECB action plan)
- Adjust monetary policy operations and portfolios (Schnabel)
- Disclosures: modify eligibility of securities as collateral in refinancing operations
 - Disclosure requirements, according to EU policies
 - Adjusted requirements for SMEs
- Collateral: consider relevant climate change risks for assets used as collateral
- Private asset purchase programmes:
 - Incorporate climate change criteria, ensure the alignment of issuers with Paris agreement legislation

II. A central bank's potential actions regarding climate change

Financial stability

- Climate-related risks can be a source of financial risk
- Develop **new indicators**
Green financial instruments, carbon footprint, exposure to climate-related physical risks)
- Ensure banks adequately **assess risks** from carbon-intensive exposures
Stress-testing (DNB, BdF, BoE)
ECB economy-wide stress-test in 2021; planning Eurosystem balance-sheet stress test in 2022
Disclosure by credit rating agencies' of how they incorporate climate risks in their ratings

II. A central bank's potential actions regarding climate change

Responsible investment

- For **non-monetary policy portfolios** so far (NFGS case studies)
 - Pension funds (ECB, BdF)
 - Third party portfolios (Buba: pension funds for German gvt and states)
 - But important data needs

Communication

- Improve awareness of the public

III. A focus on stress-testing

- Initiated with Basel II agreements in 2004
- Basel Committee: *Principles for sound stress testing practices and supervision* in 2009
- Test the resilience banks and financial institutions, looking at bank liquidity and capital
- Two types of stress-tests:
 - **Bottom-up**: with the involvement of the banks, to check the soundness of individual banks
 - **Top-down**: without the involvement of the banks, for system-wide macroprudential and financial stability risks
- In the EU:
 - **EU-wide stress-test** every second year by the EBA + ECB + national authorities, on largest significant banks (last one in 2021)
 - **Thematic stress-test** every second year by the ECB + national authorities, on significant banks (last one on liquidity risk in 2019, next one on climate risk in 2022)
 - **Top-down macroprudential** stress-tests (2021: ECB economy-wide climate stress-test)
 - Leeway for additional stress-tests on individual banks or groups of banks if necessary

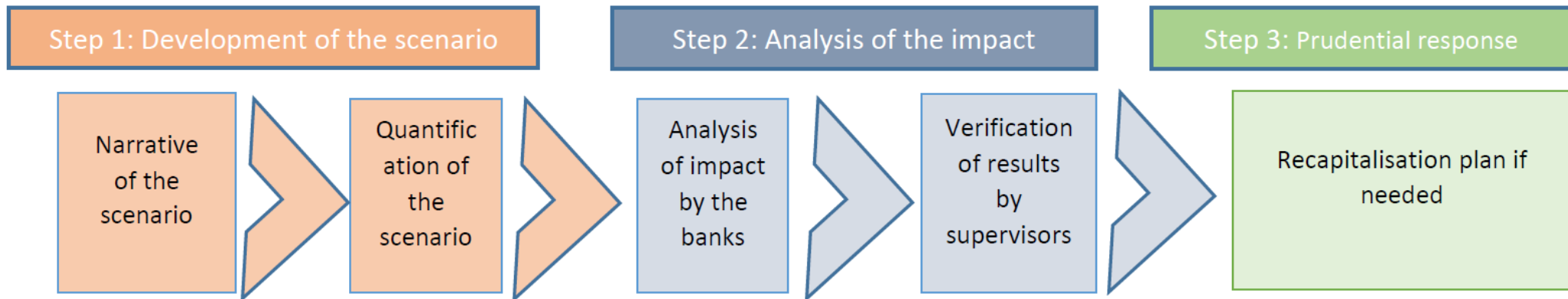
III. A focus on stress-testing

- **Simulating :**

The impact of an economic and financial crisis

On each tested bank

On the solidity of the banking system



source: Fourèle, Idier, Scalone, Schilte, EcoNotepad blog post #195

Adverse scenario: severe but plausible; trajectories for relevant macro and financial variables

Horizon: in general 3 years

Impact assessment: on bank's balance sheet, income, risks associated to assets held

Prudential response: if a bank cannot absorb the shock. ECB + national authorities

III. A focus on stress-testing

How may climate change impact the economy?

Physical risks

- Short-term: weather-related catastrophes (storms, floods).
Have been increasing over the past 40 years.
- Longer term: drop in productivity, desertification, higher sea-level, etc...
Implying a lower GDP.
Time horizon: 2100

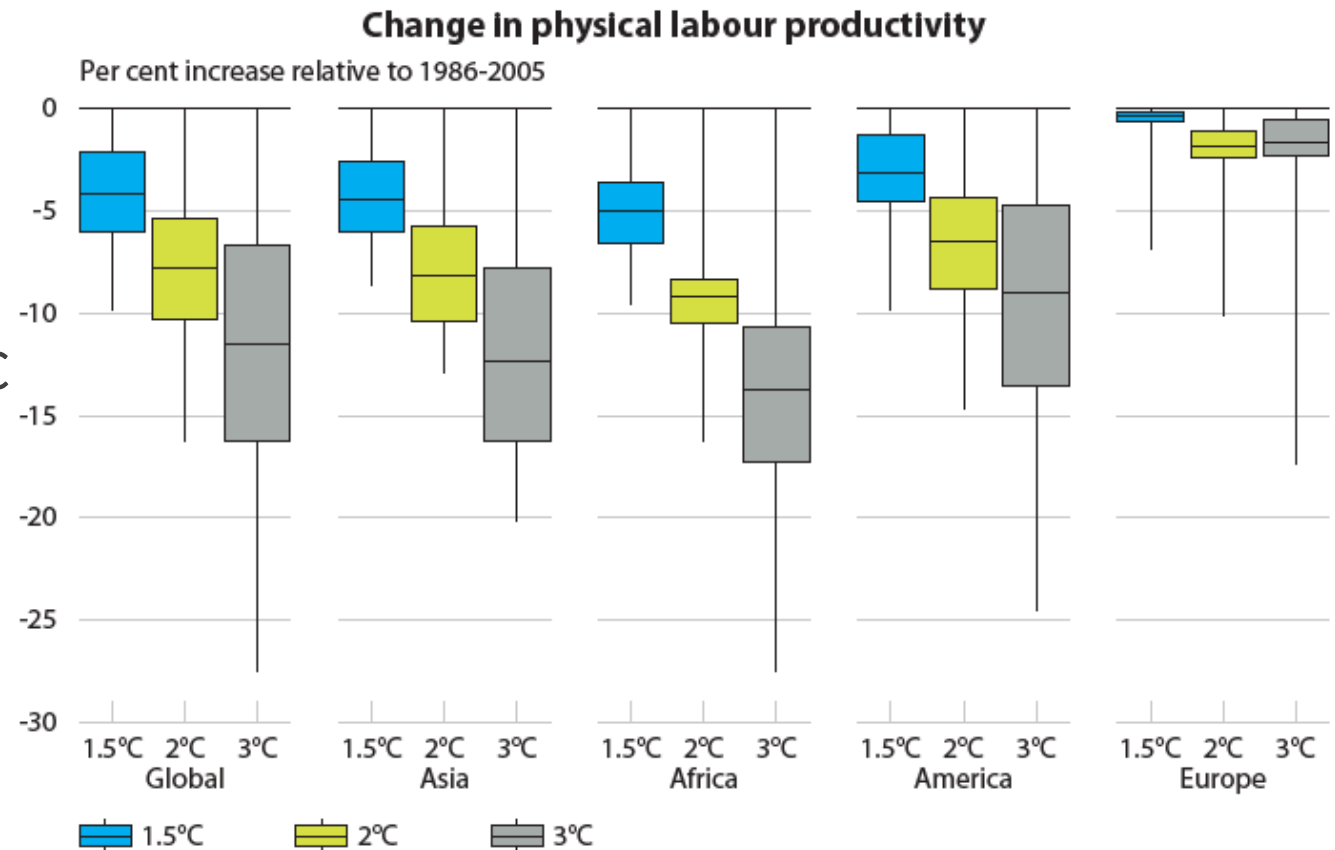
III. A focus on stress-testing

How may climate change impact the economy?

Physical risks

Ex: Physical labour productivity

- Reduced by heat and humidity
- Compared to a baseline of +0,6°C (1986-2005 reference)
- Tropical regions more exposed, Europe less exposed



Source: Dasgupta et al. (in review), including future population growth based on the SSP2.

Source: NGFS Climate scenarios phase II, June 2021

III. A focus on stress-testing

How may climate change impact the economy?

Transition risks

- Move towards a low-carbon economy may be disruptive
- May impact sectors and firms heterogeneously
e.g. fossil fuel energy vs. renewables
- Higher risk if policy action is delayed and provokes sharp changes
- Sudden technological break-through
- May trigger sharp adjustment in asset prices
- Clear benefit in front-loading mitigation policies

III. A focus on stress-testing

How may climate change impact the economy?

Asset pricing (Mersch)

- Underestimated risks in new green financial products
- May lead to asset price bubble
- Cannot know until the bubble bursts

III. A focus on stress-testing

Specificities of climate change scenarios

	Standard scenarios	Climate change scenarios	
		Transition risks	Physical risks
Horizon	Short to medium run	Short, medium and long run	Short, medium and long run
Scenario drivers	Economic and financial	Climate policy and technological change	Conditional on outcomes of transition scenarios and/or environmental dynamics
Shock values	Guidance from historical data	Little to no guidance from history	Little to no guidance from history
Aggregation	National	Sectoral	Sectoral and geographical
Feedback loops	Work in progress (e.g. macro models with financial frictions)	Work in progress (e.g. interaction between policy and economy)	Interaction climate - economy

III. A focus on stress-testing

The BdF-ACPR pilote exercise

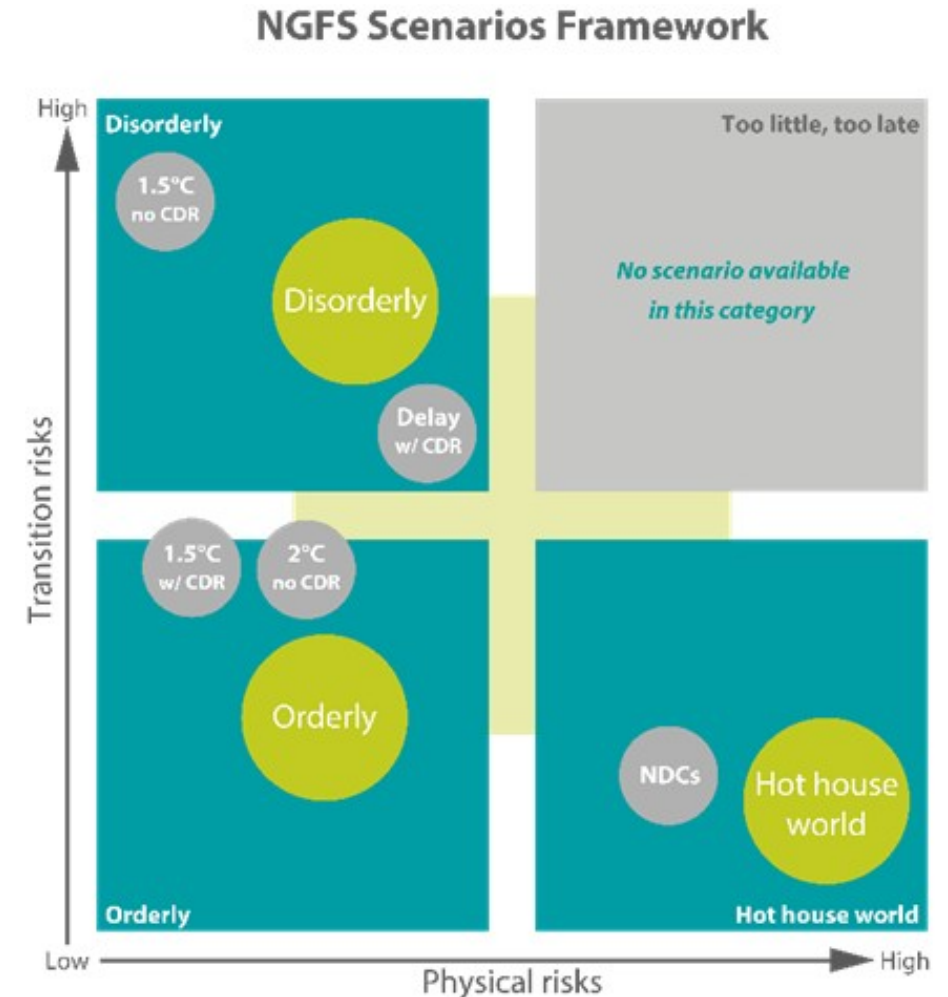
Main characteristics:

- Bottom-up exercise
- Covering banks and insurers
- Participation on a voluntary basis
- No implications in term of regulatory capital

Building on the June 2020 NGFS high-level scenarios providing:

- Narratives
- Aggregate economic outcomes
- Emission reduction outcomes

Focus on transition risks, one physical risks scenario



Source: NGFS Climate scenarios for central banks and supervisors, June 2020

III. A focus on stress-testing

The BdF-ACPR pilote exercise

Main characteristics:

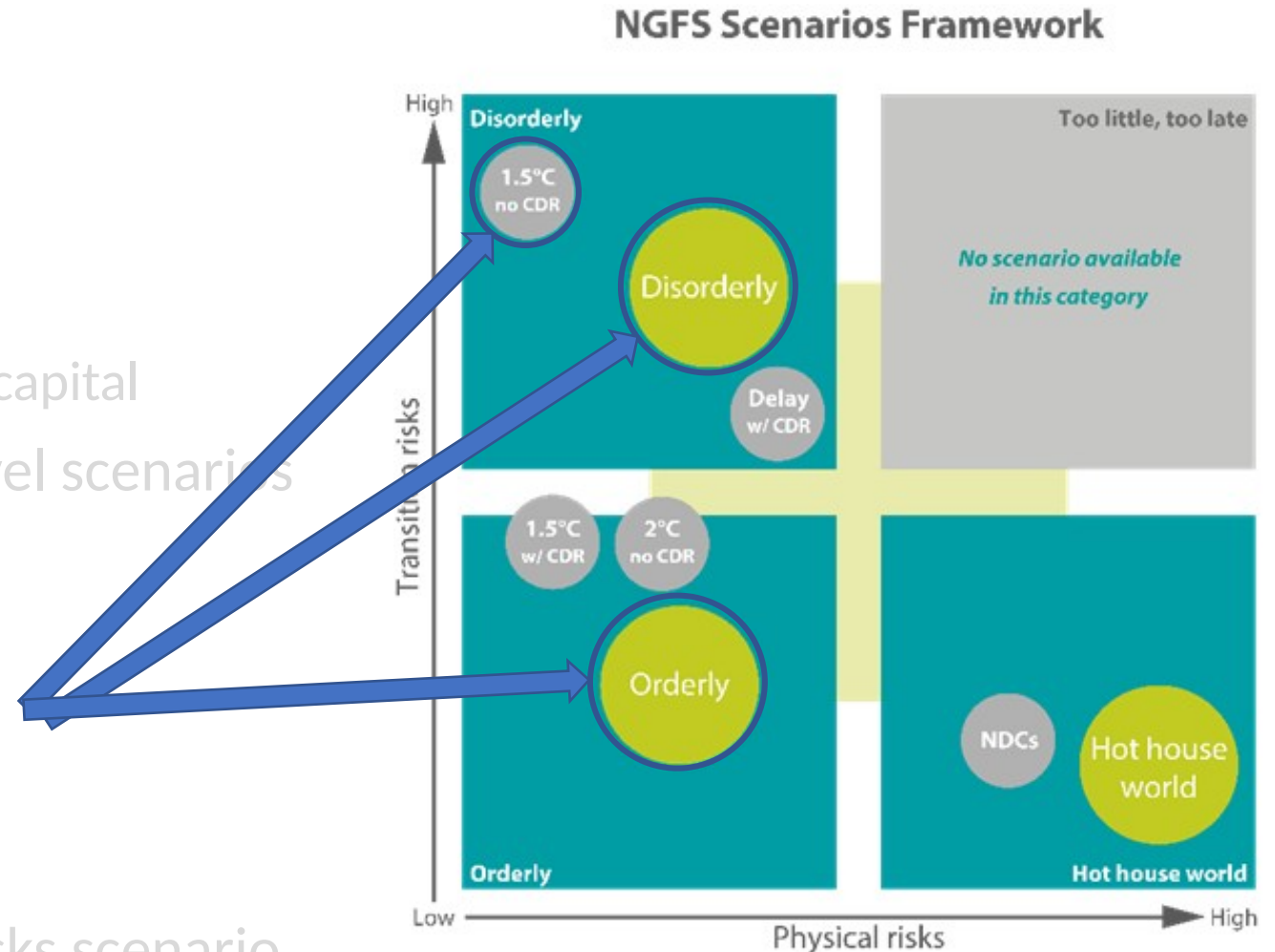
- Involves financial institutions
- Participation on a voluntary basis
- No implications in term of regulatory capital

Building on the June 2020 NGFS high-level scenarios providing:

- Narratives
- Aggregate economic outcomes
- Emission reduction outcomes

**3 transition scenarios
for the ACPR pilote
exercise**

**Focus on transition risks, one physical risks scenario
+ 1 physical risks
scenario**



Source: NGFS Climate scenarios for central banks and supervisors, June 2020

III. A focus on stress-testing

The BdF-ACPR pilote exercise

Scenario narratives for transition risks:

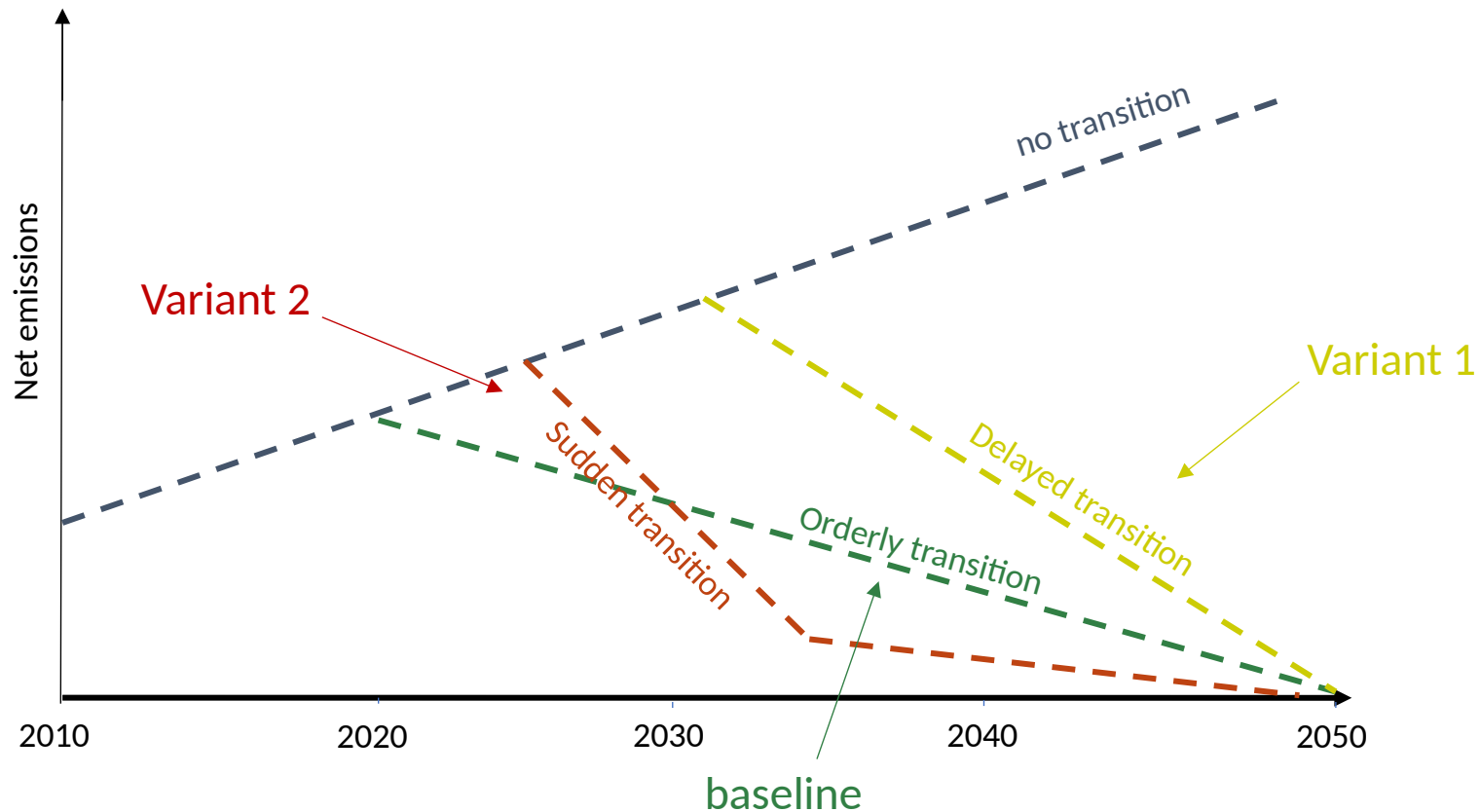
- 1 **baseline** scenario and 2 **adverse variants**
- 2 shock variables related to transition risks:
 - **carbon price**
 - **productivity**
- Adverse variants depending on:
 - **Timing** of the shocks
 - **Size** of the shocks
 - Assumptions about technology – **productivity**
- Time horizon: 2020-2050

III. A focus on stress-testing

The BdF-ACPR pilote exercise

What type of transition to reach zero net emissions by 2050?

Orderly (**baseline**) and disorderly scenarios (**2 adverse variants**)



III. A focus on stress-testing

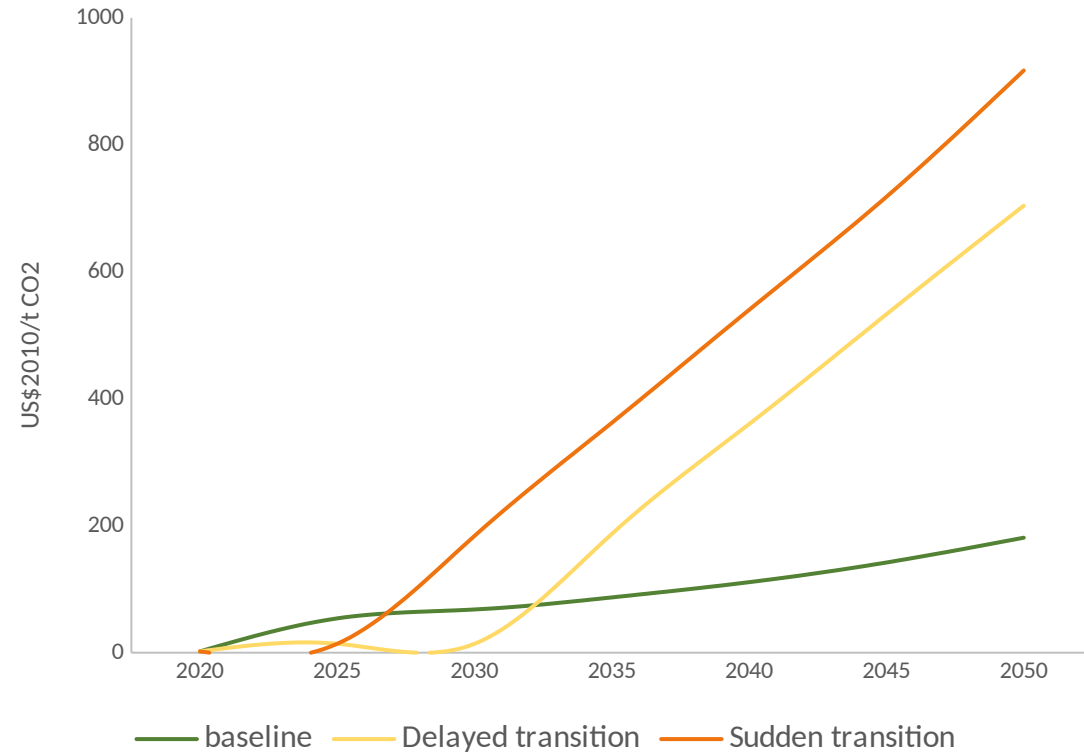
Carbon price

The BdF-ACPR pilote exercise

- **Carbon prices:**

3 trajectories aligned with the (2020) NGFS *high-level* reference scenarios

- Variant 1: from \$14 in 2030 to \$704 in 2050 (/t CO₂)
- Variant 2: from \$14 in 2025 to \$917 in 2050 (/t CO₂)

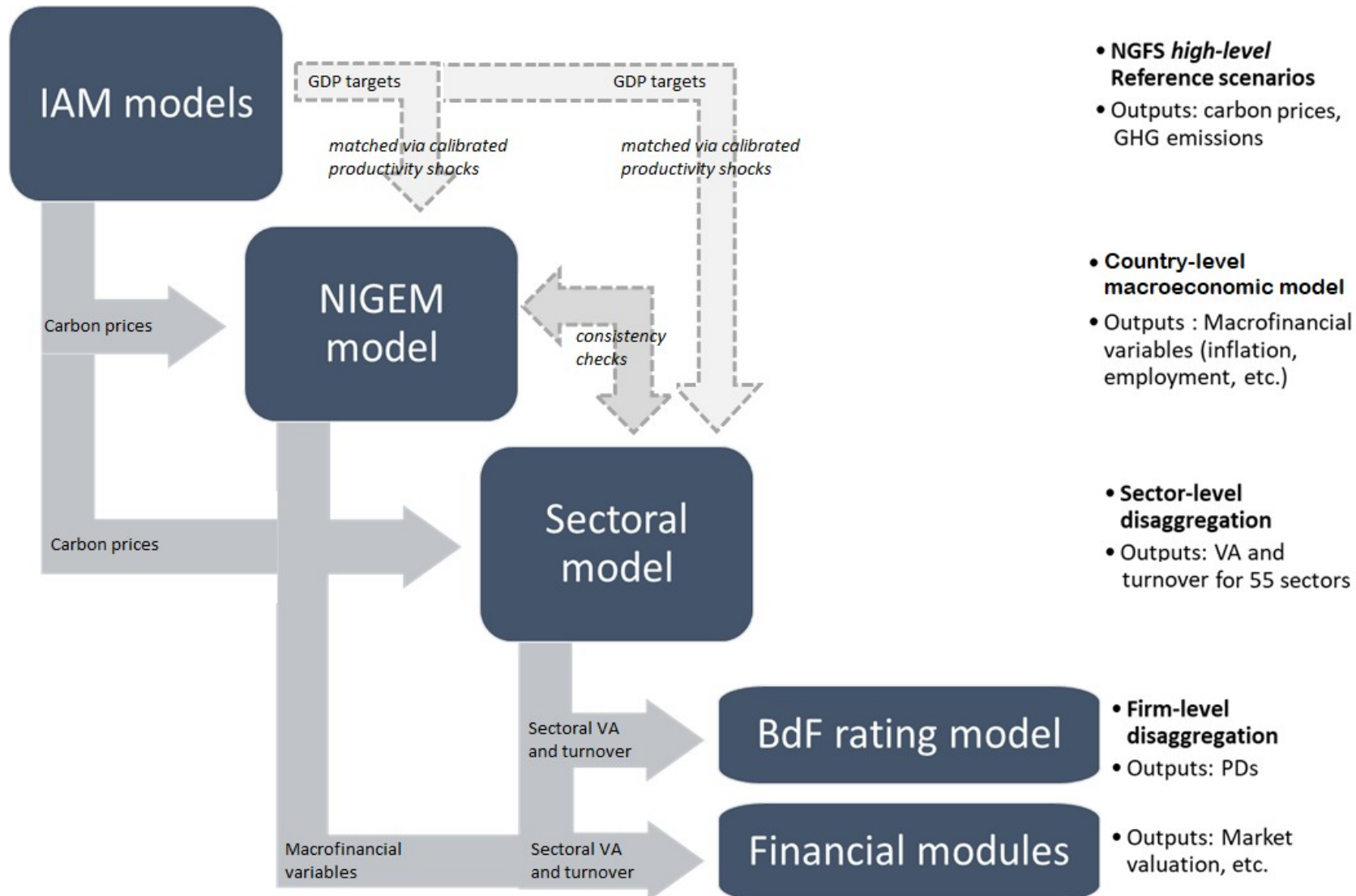


- **Calibration:**

- *Delayed transition*: Calibrated on the NGFS GDP outcomes, assuming positive productivity gains (and postponed increases in carbon prices)
- *Sudden transition*: Constant productivity – no calibration on the NGFS GDP outcomes

III. A focus on stress-testing

The BdF-ACPR pilote exercise

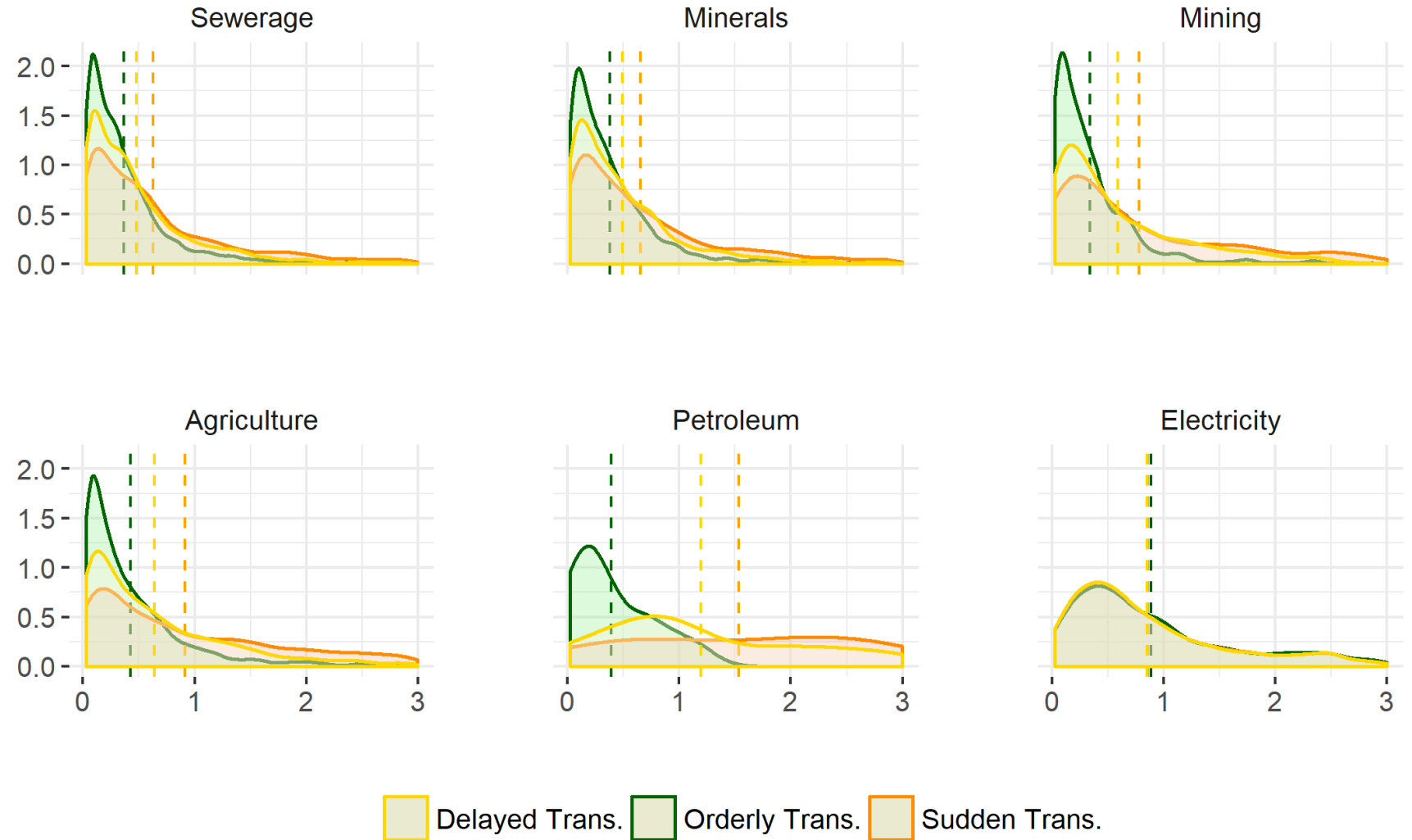


III. A focus on stress-testing

The BdF-ACPR pilote exercise

Impacts on :

- GDP, inflation, unemployment
 - Sectoral value added and turnover
 - **Default probabilities**
 - Corporate credit spreads
 - Asset prices
- ... to be used by financial institution to assess their situation



Firms' default probability densities in 2050

Source: Allen et al (2020)

III. A focus on stress-testing

The BdF-ACPR pilote exercise

Main outcomes:

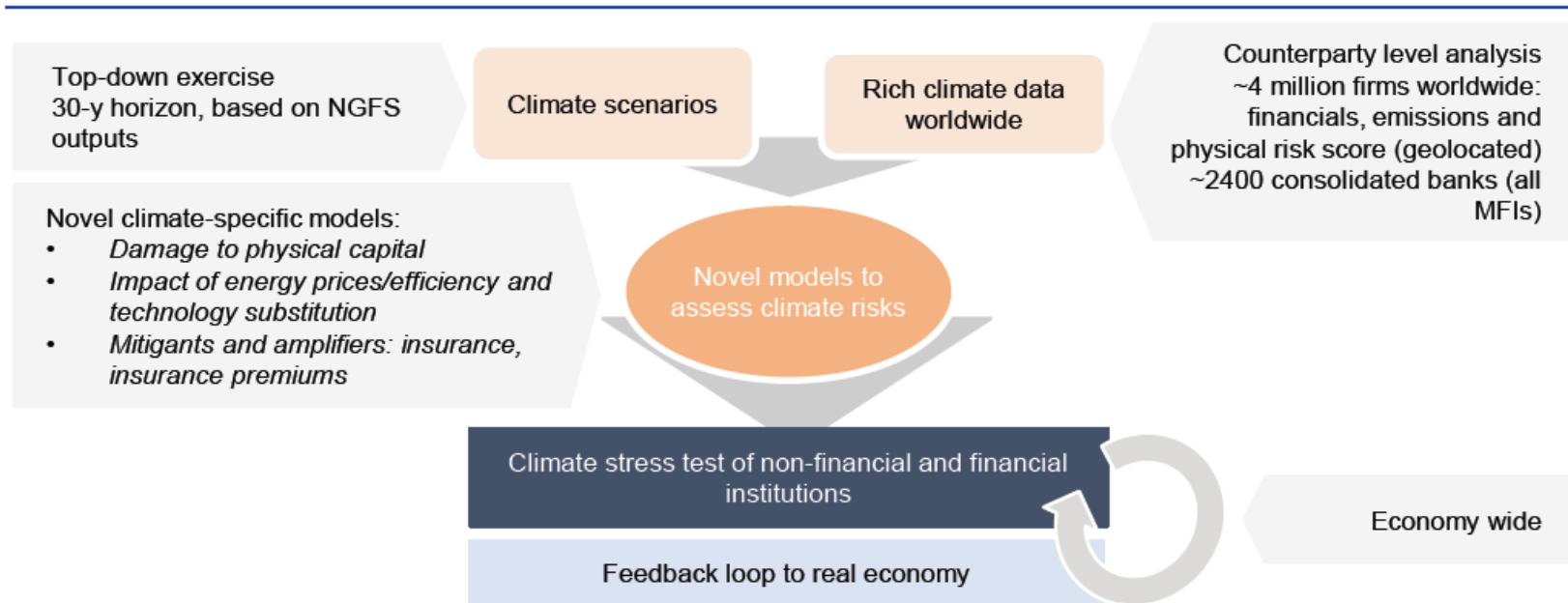
- Reached its 3 main objectives:
 - Very strong **mobilization of the industry** (> 85% of banks activities ; >75% insurance activities)
 - Catalyzed **reflections** on taking climate change into account
 - An **assessment of exposure** to climate risk and an identification of strategies to mitigate this risk
- Challenges for future work:
 - Scenarios:
 - Not enough variability across NGFS scenarios
 - Identification of sensitive sectors and **granularity**
 - Interplay** between sectoral and geographical risks
 - Methodological issues:
 - Handling long term horizons
 - Sectoral differentiation + precise location of exposures for banks
 - Integration into internal models...

III. A focus on stress-testing

The ECB stress-test exercise

Main characteristics:

- **Top-down** exercise: no direct involvement of financial institutions
- Both transition and physical risks
- **granular firm-level data** to estimate impact on firms' default probability
- **Mapped to banks** through granular data on loans and security holdings



III. A focus on stress-testing

The ECB stress-test exercise

Also using **NGFS scenarios** as reference for aggregate scenarios

Detailed data on firm-level emissions

- Worldwide
 - Over 10 years
 - Inference to cover all EU firms (4 million private companies)
 - Estimate firm-level carbon costs and future emissions
 - Estimate impact on firms' default probability
 - Forecast future emissions until 2100
-
- Combined with financial data: final sample of 2,3 millions European firms

III. A focus on stress-testing

The ECB stress-test exercise

Main outcomes:

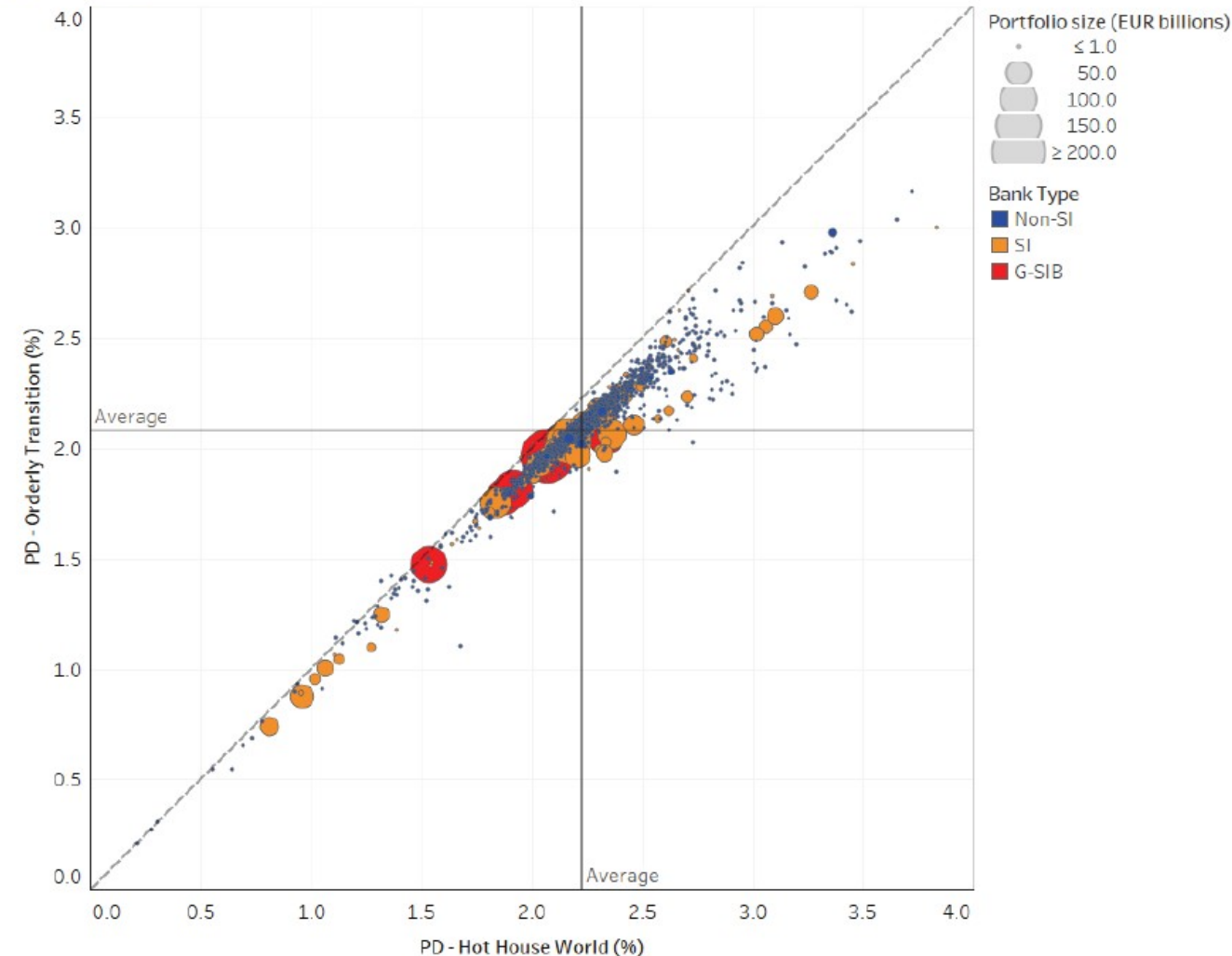
- Benefits to **acting early**
- Moderate climate risks until 2050, but concentrated in some sectors / geographical areas
- Impact potentially significant for corporates and banks most exposed
- Impact on banks mostly due to physical risk

=> Climate change a major source of systemic risk

Bank-level probability of default of corporate loan portfolio

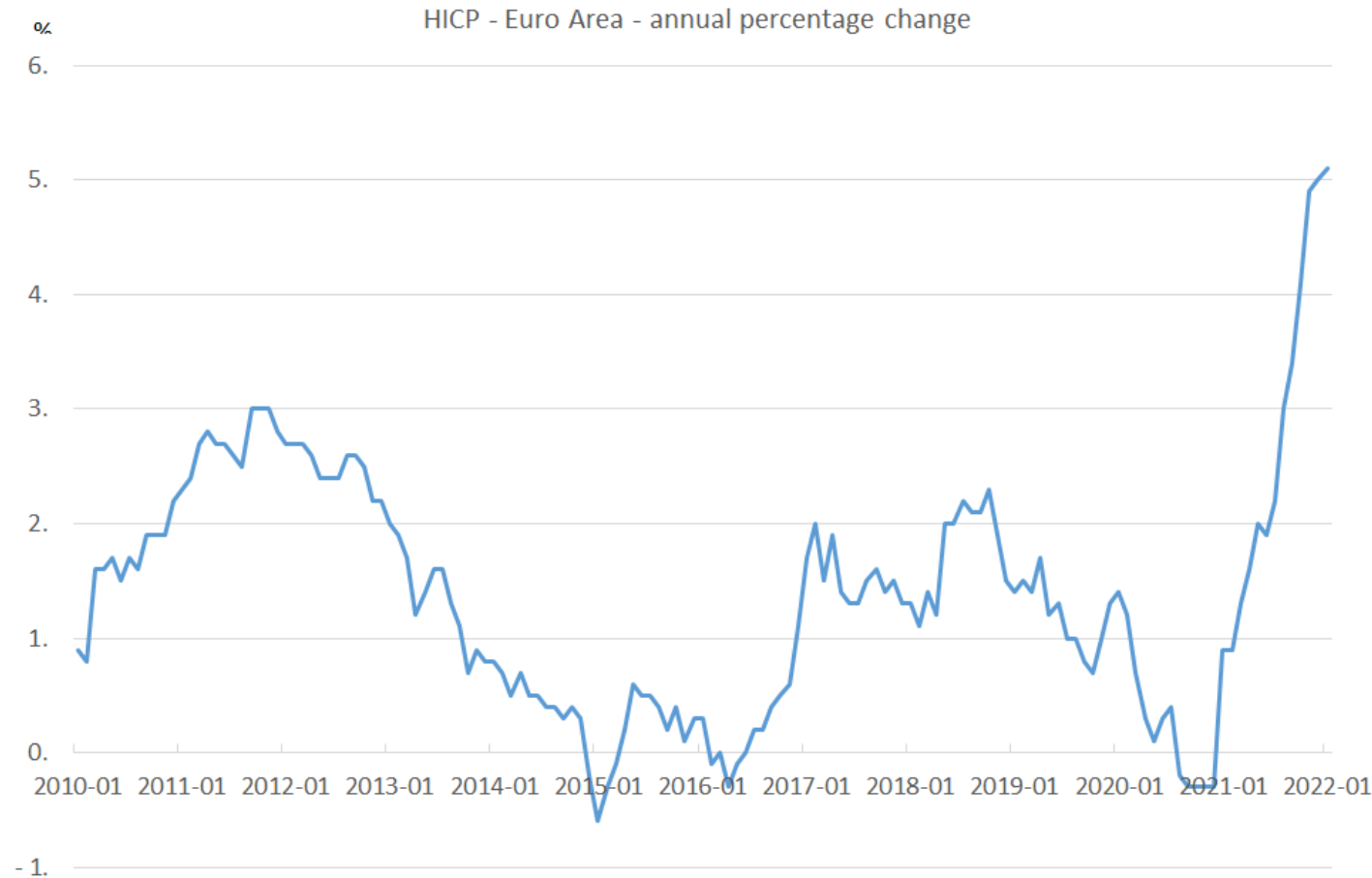
y-axis: Orderly transition; x-axis: Hot house world

(percentages)



Source: ECB economy-wide stress-test, Occasional Paper Series, September 2021

IV. Inflation and low carbon transition

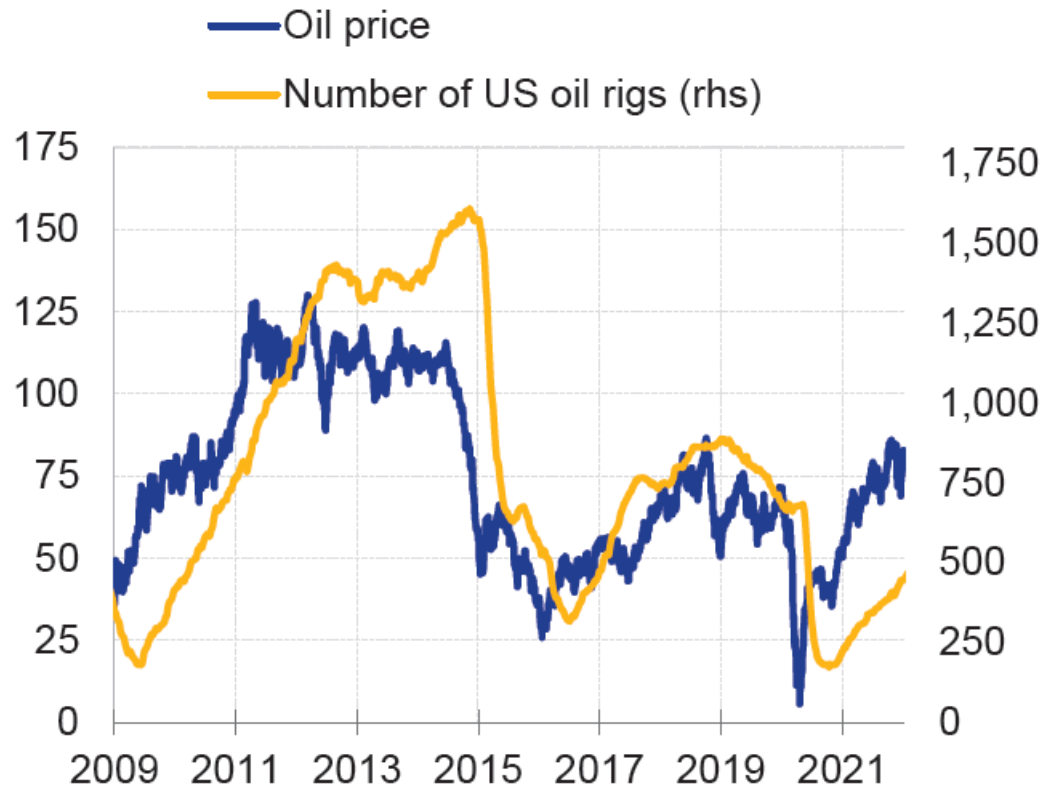


Base effects due to energy price fall in 2020 during the pandemic, part of 2021 energy price increase is a reversal

VAT cuts in 2020, then reversed in 2021 => increased inflation in 2021 (Germany, Ireland)

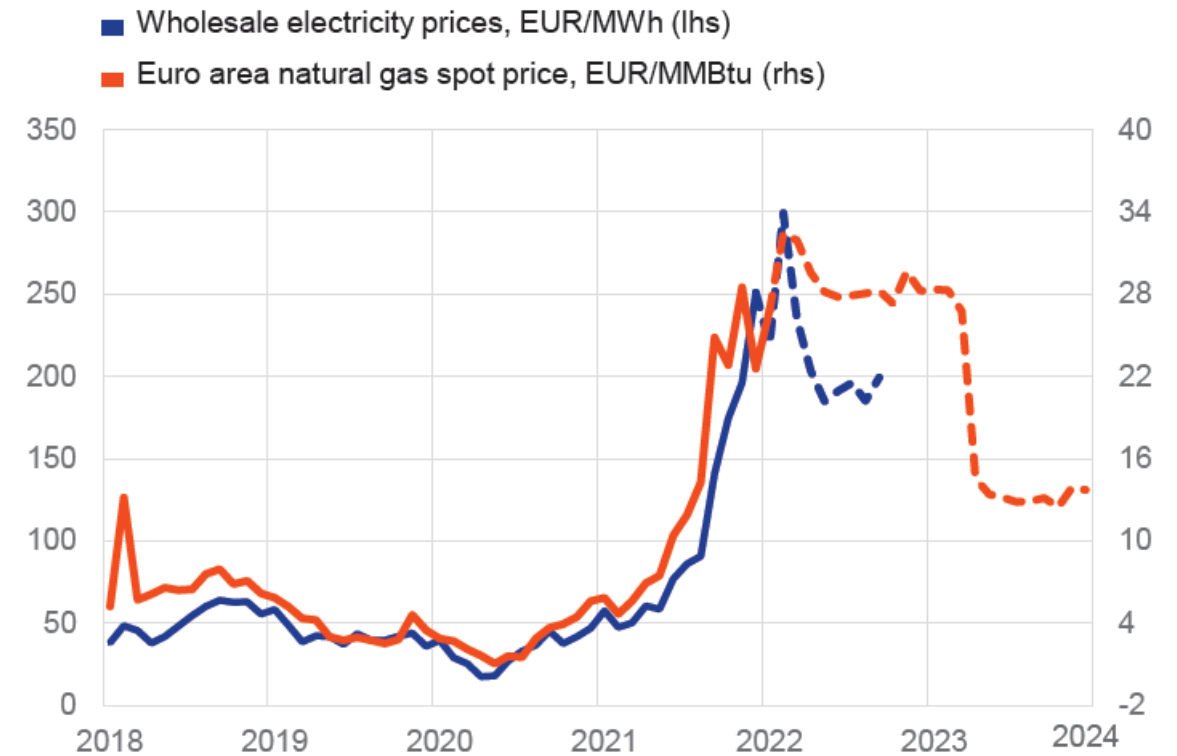
Energy price increase

IV. Inflation and low carbon transition



Latest observation: 06/01/2022 (oil price), 31/12/2021 (rig count).

Sources: Schnabel Jan. 8, 2022; Bloomberg and Baker Hughes



Sources: Bloomberg for electricity and gas futures, ICE for gas spot prices, OMIO, Gestore Mercati Energetici, Fraunhofer ISE and ENTSOE for wholesale electricity prices.

Note: Cut-off date for futures is 06/01/2022. Electricity wholesale prices is a weighted average of electricity prices in Germany, France, Spain, Italy and the Netherlands.

Latest observation: November 2021 for electricity wholesale prices and December 2021 for gas spot prices.

IV. Inflation and low carbon transition

Increase in global energy prices:

- **Supply bottlenecks** due to past lockdowns
- **Demand increase** as economy is catching up

⇒ Could indicate a temporary shock like previous energy price shocks

But domestic low carbon transition policies

- Plausible future rise in **carbon price**, carbon tax + EU ETS
- **Subdued investment** in fossil fuels
- Current green energy production capacity insufficient
- Increase in production capacity takes time

⇒ **Energy supply-demand imbalances** could be **protracted**

- Using gas to bridge the gap, so gas prices increasing too, influence electricity prices.

IV. Inflation and low carbon transition

Diagnostic is key to determine the central bank's reaction

- If **short-lived shock**:

- Monetary policy tightening would amplify negative effect on demand and output
- Monetary policy's delayed effect would arrive too late
- No threat to *medium run* price stability
- Inflation expectations remain anchored

⇒ CB should **look through**, stabilize core inflation

- But possibility of « **greenflation** »?

- Durable increase in carbon price
- Strong investment boosting demand and output growth
- Use of additional tax receipts (household transfers versus lowering other taxes)

- **Protracted energy price increase**, closer to a demand than supply shock?

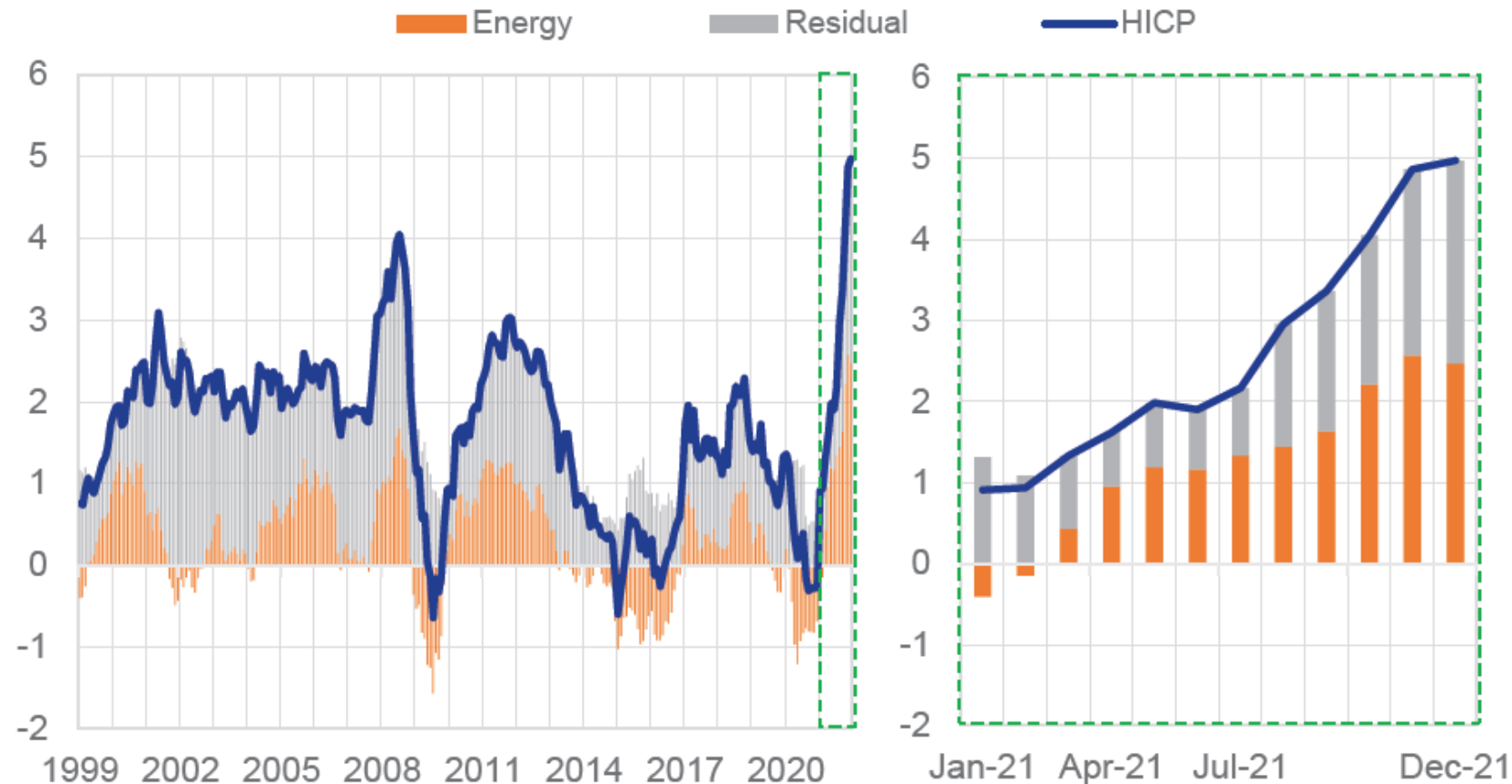
- Possibility of deanchoring of inflation expectations, changing pricing and wage behaviour
- Risk of second round effects with a price-wage inflationist spiral

⇒ CB **may have to react**, signalling commitment to price stability

IV. Inflation and low carbon transition

Historically: energy contributes little to CPI inflation

But uncertainty: contribution could stay above historical average for longer

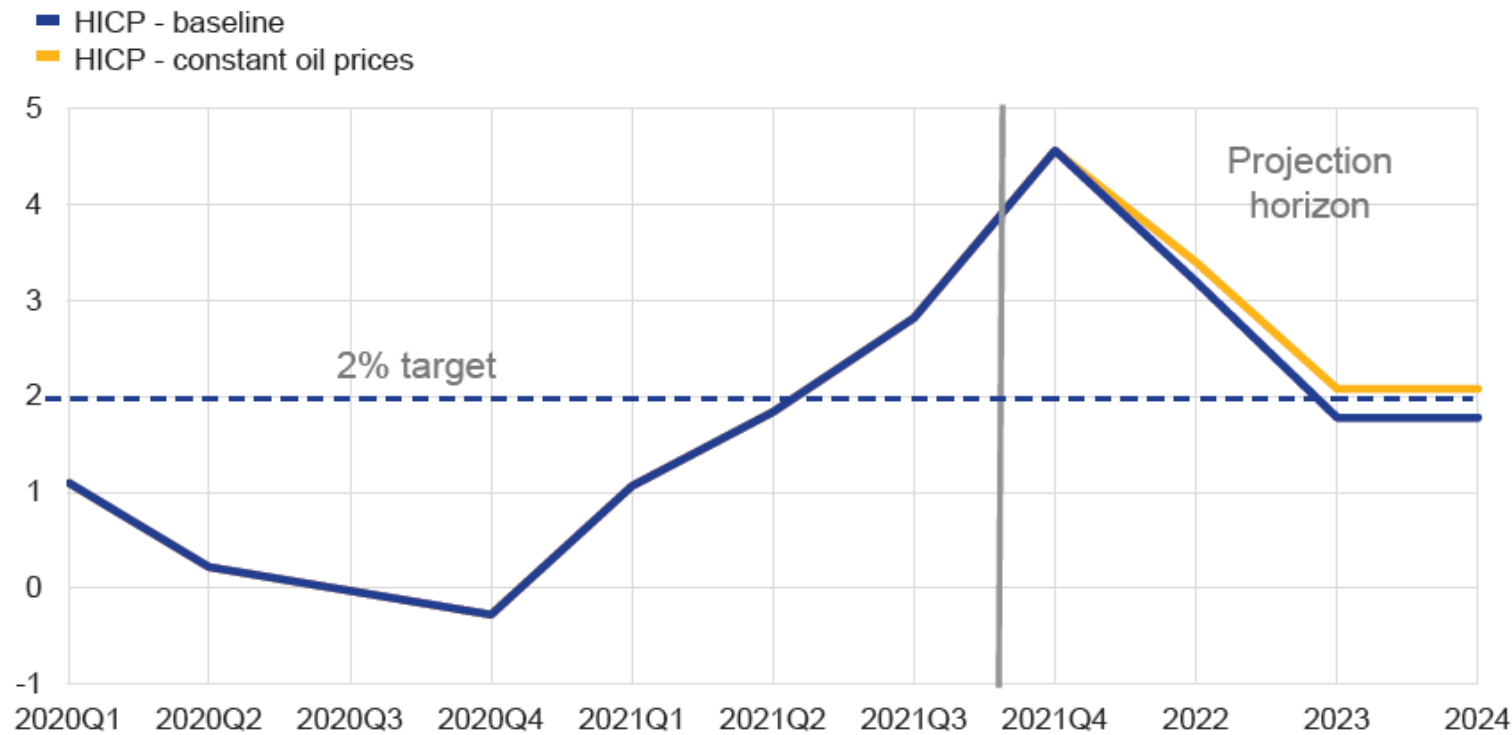


Source: Eurostat and ECB staff calculations.

IV. Inflation and low carbon transition

Key criteria :

- energy prices but more importantly **wage behaviour**
- **medium-term inflation** within the forecast horizon, at the horizon of monetary policy transmission (18 months to two years delay) so 2023-2024



Source: Eurostat, Eurosystem staff projections (December 2021) and ECB staff calculations.

Notes: Quarterly values are reported until 2021Q4, annual values from 2022 onwards. The vertical line indicates the start of the projection horizon.

IV. Inflation and low carbon transition

ECB announcements:

- November 2021: interest rate in 2022 rise « very unlikely »
- 3 February 2022: Not excluded. Risks to inflation outlook are tilted to the upside

BoE: interest rate hikes in December and February to reach 0,5%

Fed: interest rate hike foreseen for March

In the **long-run**, many **uncertainties** around the effect of the green transition:

- Pattern of carbon price increase (steady vs one-off)
- Capital reallocation effects (negative productivity shock costly in terms of output?)
- Speed of substitution across energy types?
- Effects of carbon tax revenues allocation
- Effects on long-term neutral interest rate

Supplementary material

In addition to the documents distributed in class:

- Alogoskoufis et al., ECB economy-wide climate stress test, ECB occasional paper series, September 2021
- Schnabel, “Looking through higher energy prices? Monetary policy and the green transition”, Speech, Jan 2022
- ACPR, “A first assessment of financial risks stemming from climate change: The main results of the 2020 climate pilot exercise”, 2021
- NGFS, “NGFS Climate Scenarios for central banks and supervisors”, June 2020
- Fourel et al., “Bank stress tests: tools for prudential analysis – Episode 1”, Eco Notepad blog post, December 2020
- Allen et al., “Climate-Related Scenarios for Financial Stability Assessment: an Application to France”, BdF Working paper #774, July 2020
- de Guindos, “Shining a light on climate risks: the ECB’s economy-wide climate stress test”, the ECB blog, March 2021