

Scenario analysis of the impacts of acute physical shocks

July 2026

Contents

Overview	3
Results – main highlights	10
Results – exploring different transmission channels	17

Overview

Focus on assessing potential trade-offs for monetary policy

- Scenarios where shocks push output and inflation in the same direction (e.g. demand shocks) are relatively easier for monetary policy to respond to.
- Key interest **from monetary policy perspective** is in exploring scenarios where policymakers may face **inflation-output trade-offs** (e.g. climate-induced supply shocks).
- Examples of such narratives include:
 - A transition scenario with an upward carbon price ratchet over several years, where monetary policy will have a large relative price shock to deal with.
 - A scenario with asymmetric climate policies across countries.
 - A scenario where physical risks intensify and monetary policy needs to respond to increasing and repeated trade-off inducing acute shocks.

A short-term scenario for monetary policy using NiGEM

- A global stylized “El Niño” narrative, with regional and year-to-year variance in physical shock occurrence and severity.
- Four acute hazards modelled: heatwaves, droughts, floods, cyclones, with calibration derived from NGFS Phase IV long-term scenarios.
- Different shocks transmit differently in the model and with contrasting effects: droughts are inflationary, heatwaves increase inflation volatility while floods and cyclones in this framework push down on both output and inflation.
- Both a combined scenario and scenarios for each acute impact in isolation are modelled, enabling exploration of different shock transmission outcomes.
- The scenario supplements the NGFS short-term scenarios with a narrative of less severe but repeated acute physical shocks.

NiGEM overview

- NiGEM – the National Institute Global Econometric Model – is a semi-structural econometric global general equilibrium policy model.
- Well-established among central banks for forecasting and scenario analysis.
- Relevant features include sticky prices, ability to model rational or adaptive expectations, and a monetary policy block with a range of possible policy settings, including Taylor Rule and a two-pillar rule.
- The model integrates detailed individual country models for the major economies, linking them through trade and financial flows to capture global economic interdependencies and spillovers.
- Includes a climate module and used in production of NGFS long-term scenarios.

Shocks pattern in the stylized modelled narrative

	2025, 2028				2026, 2029				2027, 2030			
	"La Niña" years				Neutral years				"El Niño" years			
	Drought	Heatwave	Flood	Cyclone	Drought	Heatwave	Flood	Cyclone	Drought	Heatwave	Flood	Cyclone
Latin America	no	no	yes	yes	no	no	no	yes	yes	yes	no	yes
Oceania	no	no	yes	yes	no	no	no	yes	yes	yes	no	yes
North America	no	yes	yes	yes	no	yes	no	yes	yes	no	yes	no
Asia	no	no	yes	no	no	no	no	yes	yes	yes	no	yes
Africa	no	no	yes	yes	no	no	no	no	yes	yes	no	no
Europe	yes	yes	no	no	yes	no	no	no	no	yes	yes	no

- Acute shocks are applied at continent level, and assumed to occur in the years as shown in the table above.
- Severity of shocks is lowest in 'neutral' years, higher in La Niña years, highest in El Niño years (but in all cases calibrated as less severe than tail impacts in the long-term scenarios).
- Cyclones are tropical storms – so only affect regions exposed to those hazards.

Physical shocks calibration

- Exogenous physical shocks introduced into NiGEM were **derived from the calibration of** acute impacts in **NGFS Phase IV long-term scenarios**.
- This leveraged Climate Analytics impact estimates under different climate scenarios for four acute hazards: heatwaves, droughts, floods and cyclones.
- To align with the narrative of interest, lower severities of the shocks (i.e. 60th-75th percentile) from the Net Zero 2050 scenario were used, to simulate less severe impacts than in the long-term scenarios where the focus was on tail outcomes.
- The **implementation of shocks was adjusted in the scenario** to use direct channels of impact (e.g. proxying damages to capital stock to simulate the effects of floods), to allow for the assessment of how shocks transmit through the economy.
- In comparison, Phase IV long-term scenarios used a simplified approach: the acute shocks were proxied using direct supply / demand shocks to only estimate the final GDP impacts.

Physical climate shocks transmission is modelled through a range of mechanisms

- **Heatwaves** transmit as a shock to the economy's productive capacity, including by temporarily reducing labour force availability during the shock.
- **Droughts** transmit as a shock to productive capacity in agriculture and through the corresponding impacts on global food exports and prices.
- **Floods** and **cyclones** transmit through capital stock damage, proxied by impacts on investment premium, which in the model produces material impacts on demand.
- **Monetary policy** follows a Taylor rule, responding to the output gap and deviations in expected inflation.

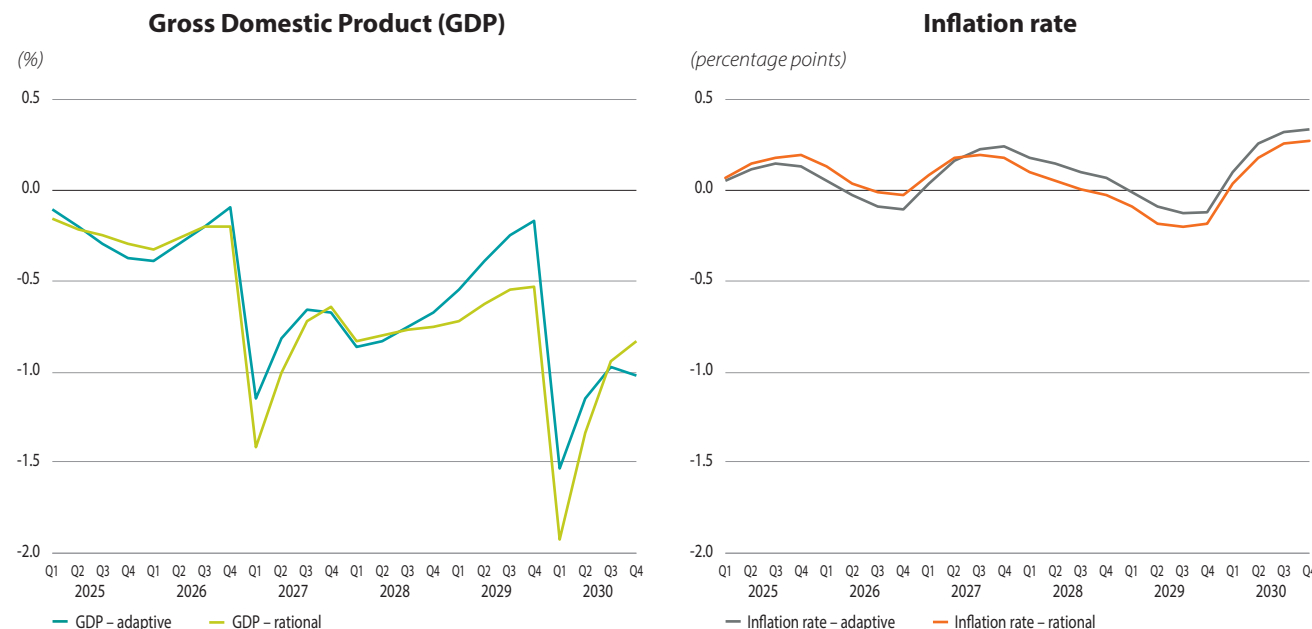
Results – main highlights

Two combined scenarios are modelled, one including all shocks, another excluding floods

- Repeated shocks lead to compounding impacts on inflation, inflation volatility and output.
- Hot / dry events (heatwaves, droughts) have larger inflationary impacts, and are more trade-off inducing, than wet events (floods, cyclones). This is because, in the model, hot / dry events transmit primarily as supply-side shocks, while wet events transmit primarily as demand-side shocks.

Global repeated and increasingly severe acute shocks generate growing macroeconomic impacts

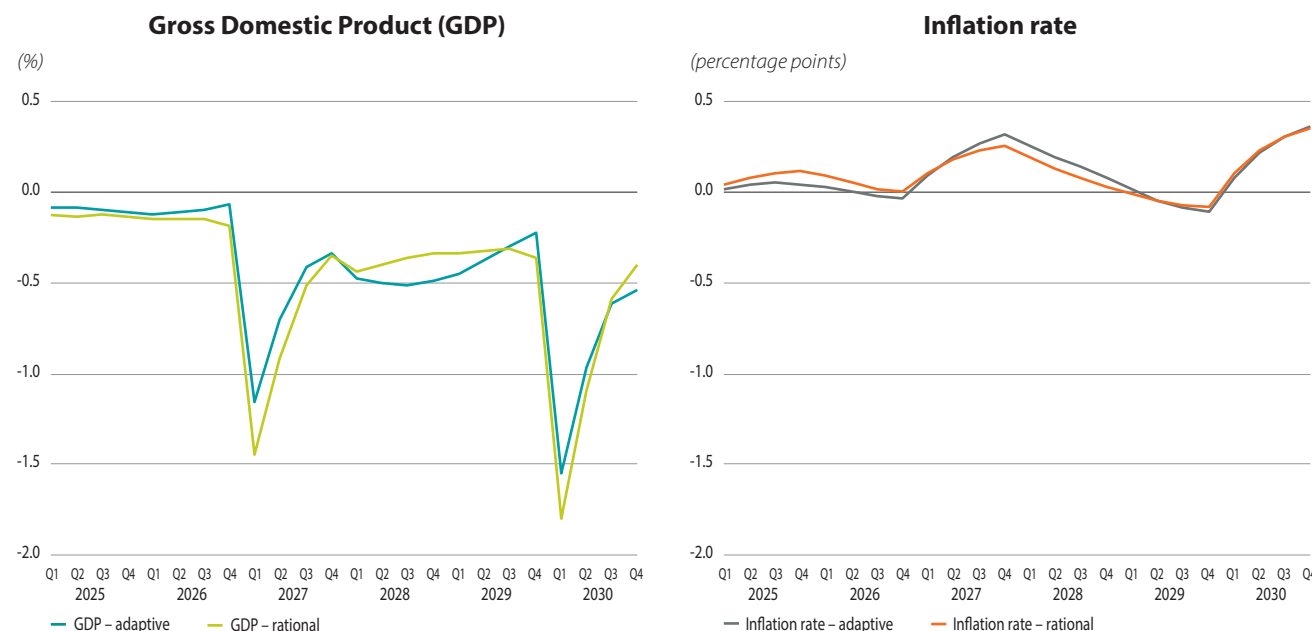
- Severity of the GDP impacts is lower compared to the NGFS short-term scenarios (2025), especially in comparison to continent-level compound shocks under the *Disasters And Policy Stagnation* scenario.
- The more severe shocks in the stylized “El Niño years” produce stronger and persistent effects on output, alongside stronger inflationary impacts.
- Global inflation oscillates between inflationary and deflationary impacts with a trend towards stronger effects following repeated acute shocks.
- Results vary depending on assumptions made about the forward-looking behaviour of agents. Rational (i.e. forward looking) expectations lead to more front-loaded effects than adaptive (i.e. partially backward looking) expectations.



Note: Aggregated global-level impacts of the scenario combining four acute hazards, following the global ‘El Niño’ storyline, under rational (forward-looking) and adaptive expectations. Impacts of all hazards include term premia shock, based on Cantelmo, Lin and Zanetti (2026). All figures in this presentation display impacts relative to a baseline without acute shocks.

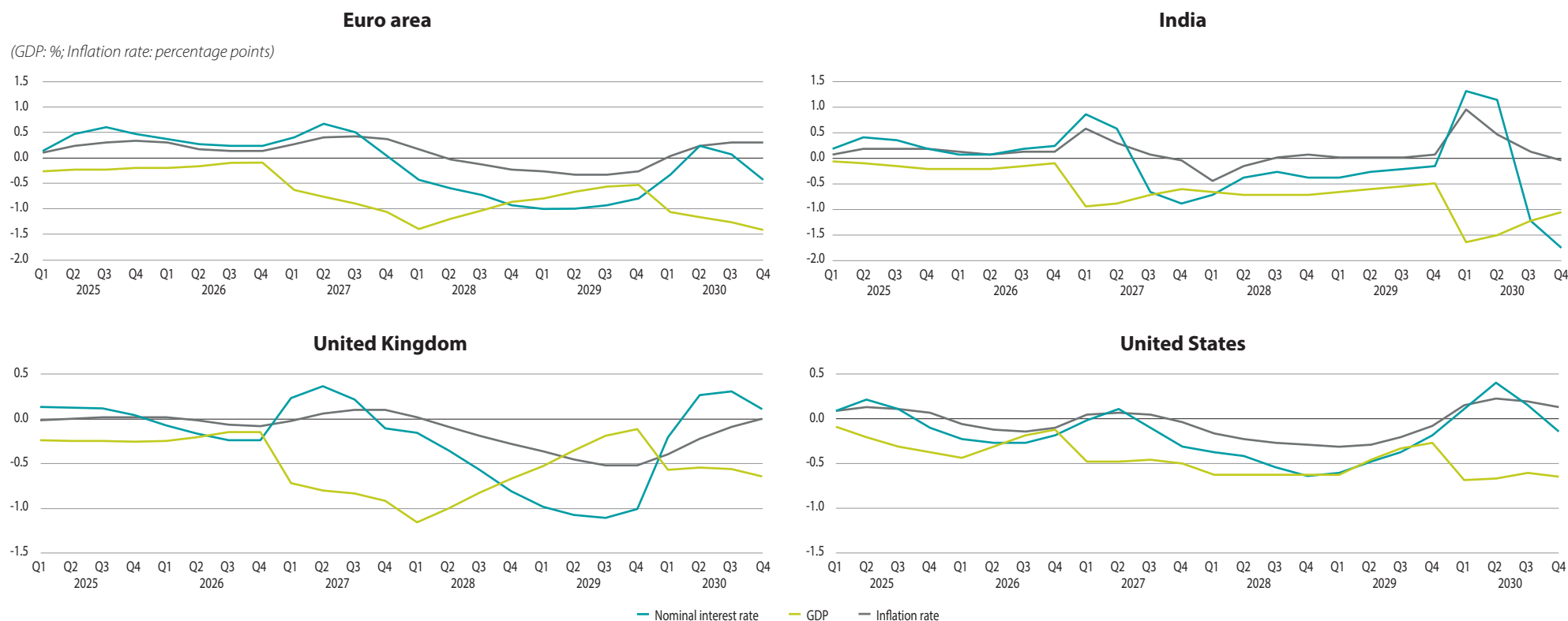
Global impacts of combined shocks *excluding* floods are more inflationary

- A variant of the global scenario is modelled excluding floods – which produce strong deflationary pressures in the model.
- Under this setting, global inflation remains volatile but the scenario is more inflationary compared to the scenario combining all four acute hazards.



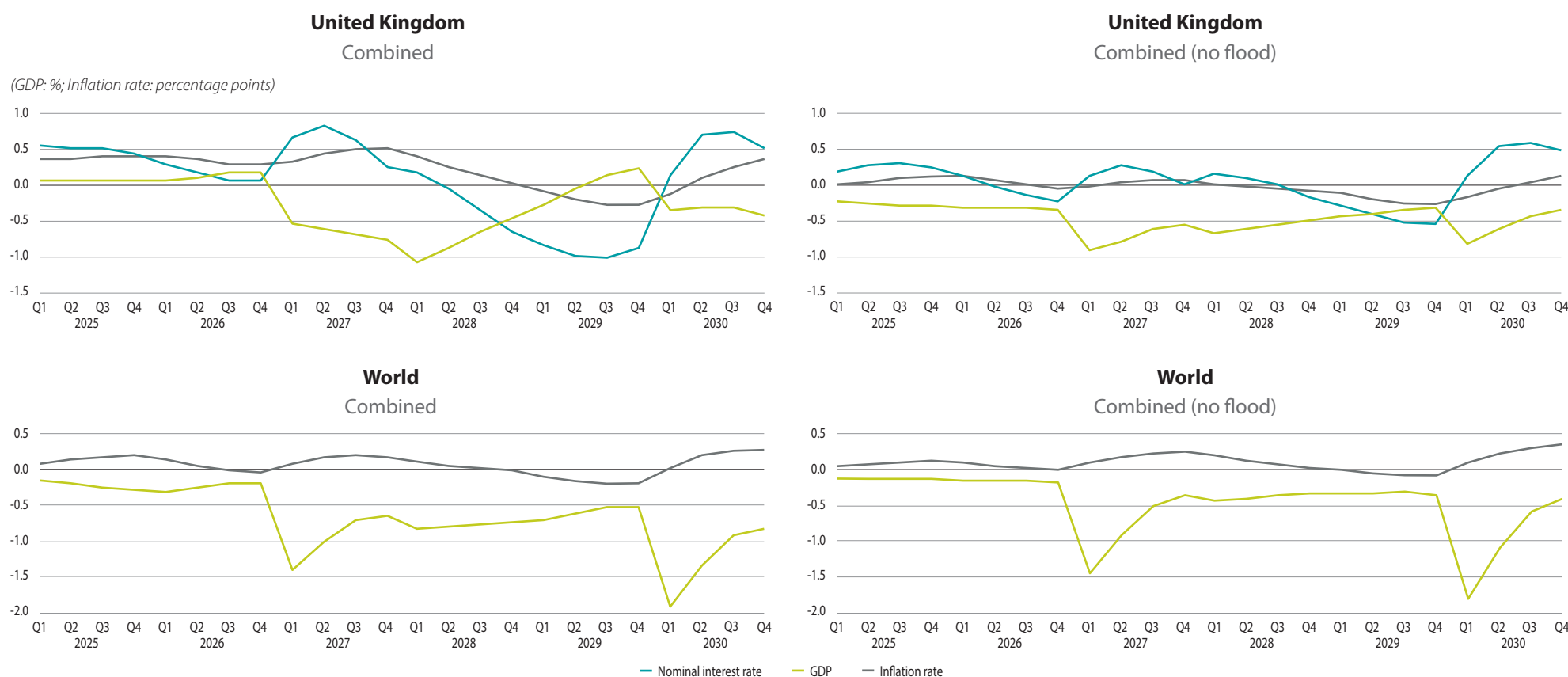
Note: Aggregated global-level impacts of the scenario combining three acute hazards (excluding floods), following the global 'El Niño' storyline, under rational and adaptive expectations.

Impacts of the global scenario differ between regions, reflecting hazard occurrence and economic exposure



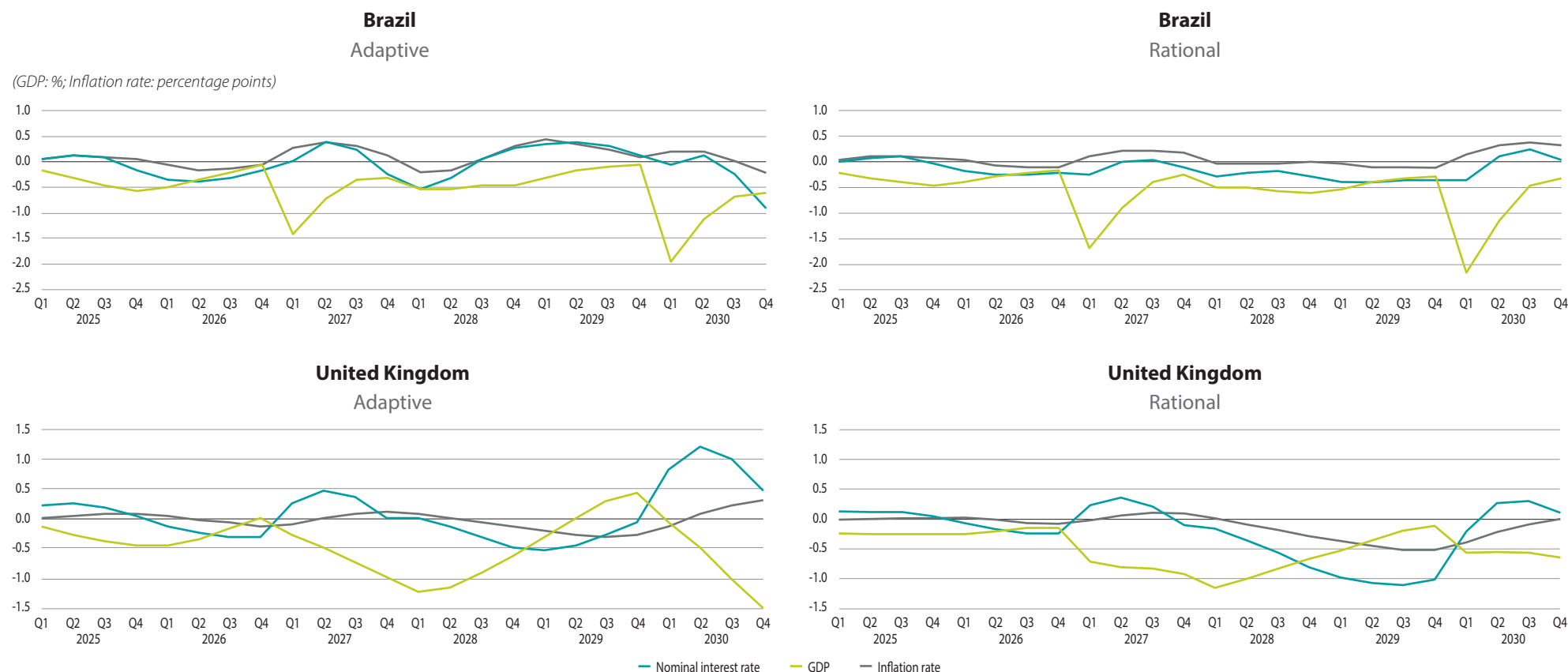
Note: Macroeconomic impacts of the scenario combining four acute hazards, following the global 'El Niño' storyline, under rational expectations, for select regions.

Combined scenario excluding floods is more inflationary than scenario including all shocks, reflecting the modelled transmission channels



Note: Macroeconomic impacts of the scenario combining four acute hazards, compared to a scenario excluding floods under rational expectations, for select regions.

Adaptive and rational expectations produce varying effects for different countries



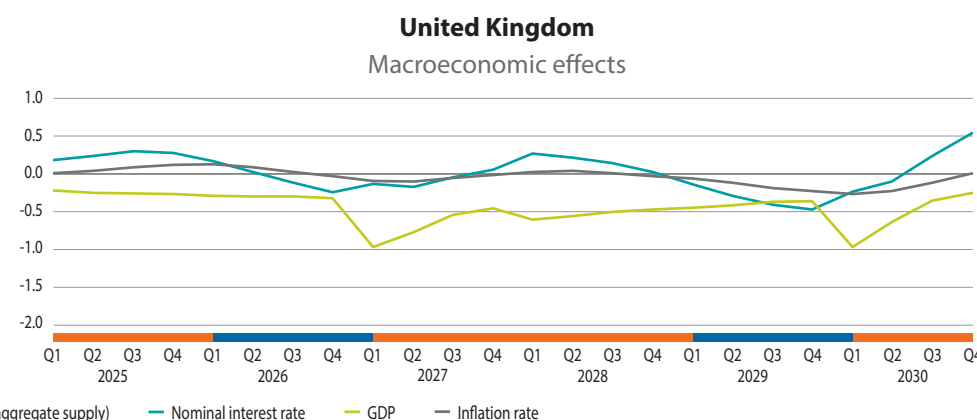
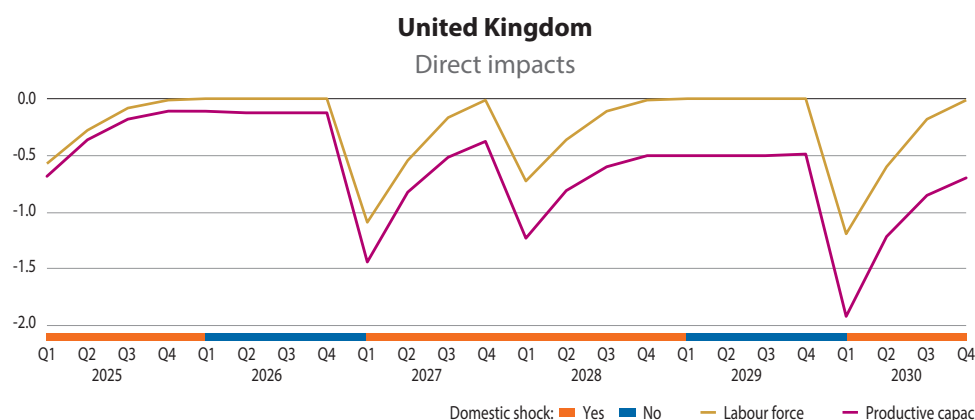
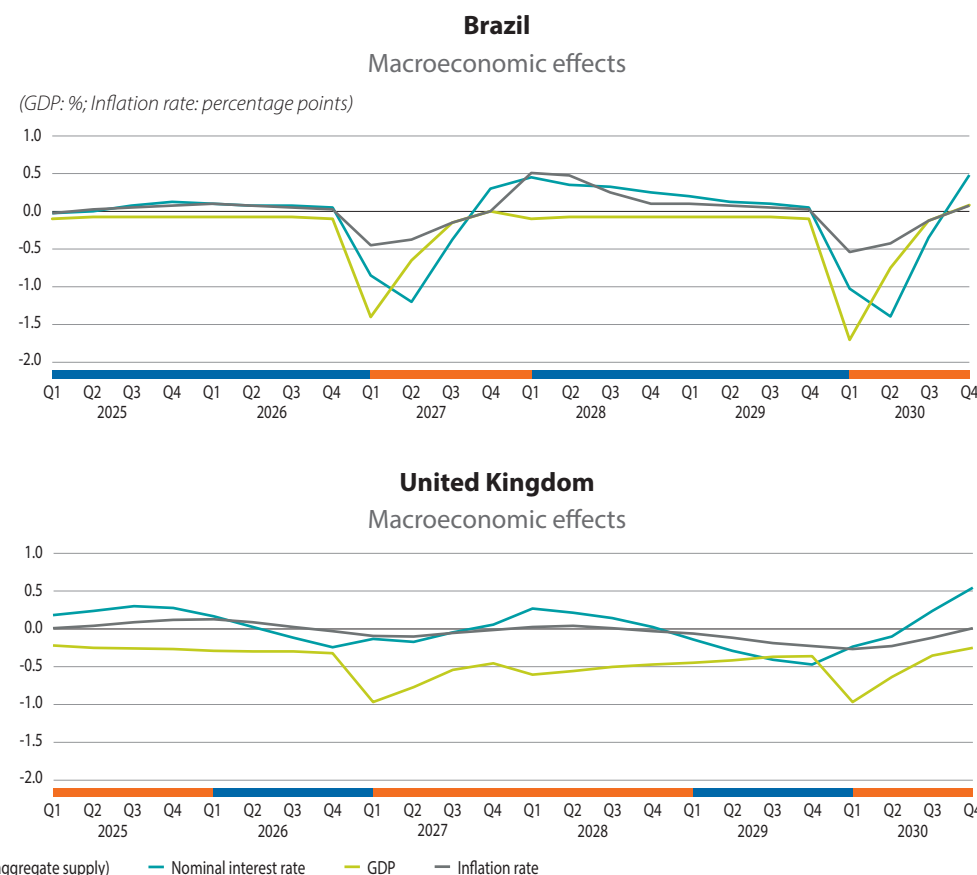
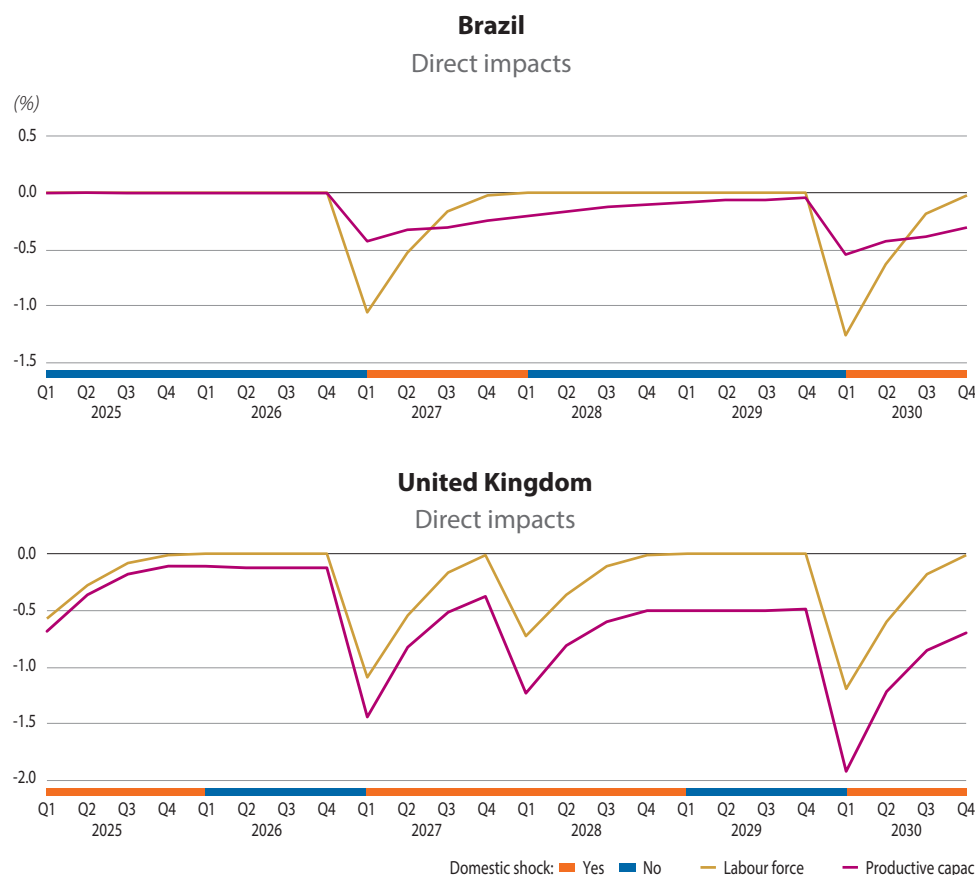
Note: Macroeconomic impacts of the global scenario combining four acute hazards, comparing the effects under rational and adaptive expectations, for select regions.

Results – exploring different transmission channels

Heatwaves push down on GDP, while increasing inflation volatility

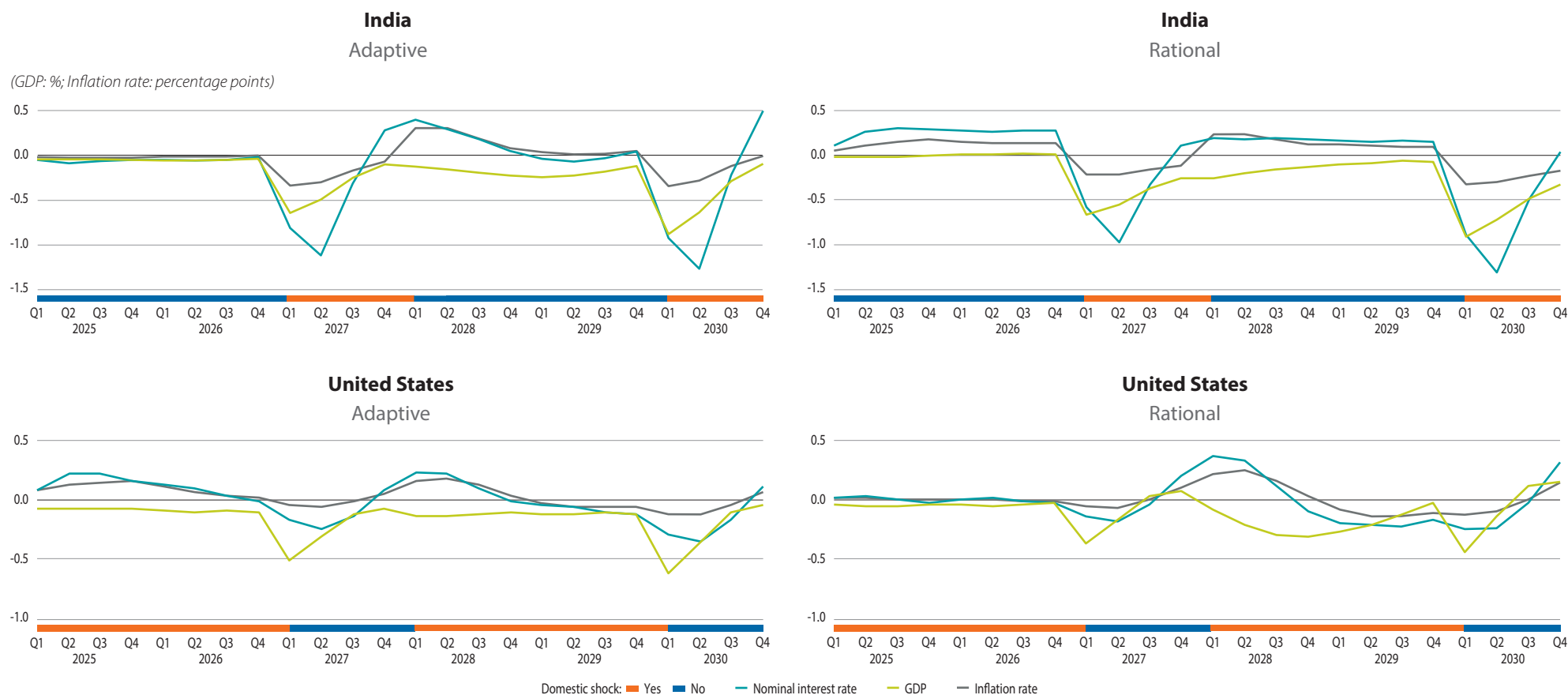
- Heatwaves transmit in the model as a shock to the economy's productive capacity and a negative (temporary) impact on the labour force.
- Heatwave shocks increase inflation volatility while reducing output.
- Domestic shocks dominate in generating adverse macroeconomic impacts.
- The size of the effect on inflation corresponds to the GDP impact resulting from the shock.

Heatwaves impact labour force, pushing down on the economy's productive capacity utilisation



Note: Impacts of a global scenario modelling heatwaves in isolation, showing direct shock impacts and the resulting macroeconomic effects for select regions. Occurrence of shocks follows the main 'El Niño' storyline, with years where a jurisdiction experiences a domestic shock denoted by orange bars underneath the charts. All charts show results under rational expectations, unless otherwise stated.

Heatwaves tend to have stronger and more volatile impacts on inflation when agents have adaptive expectations

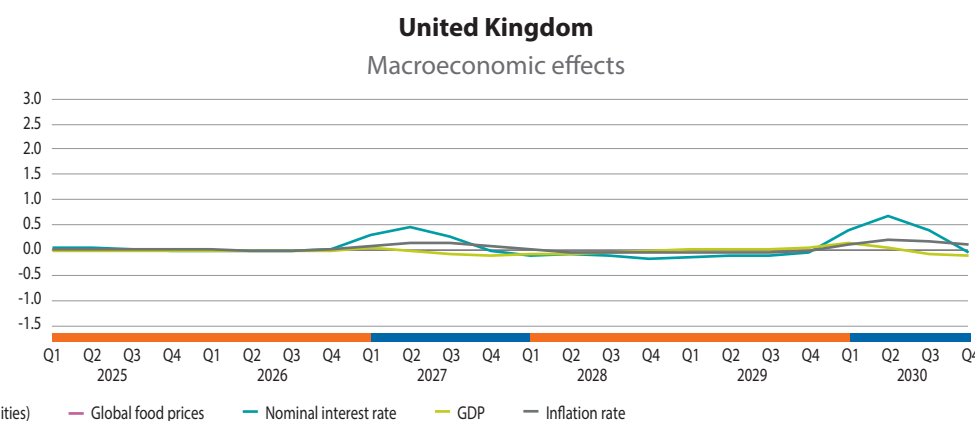
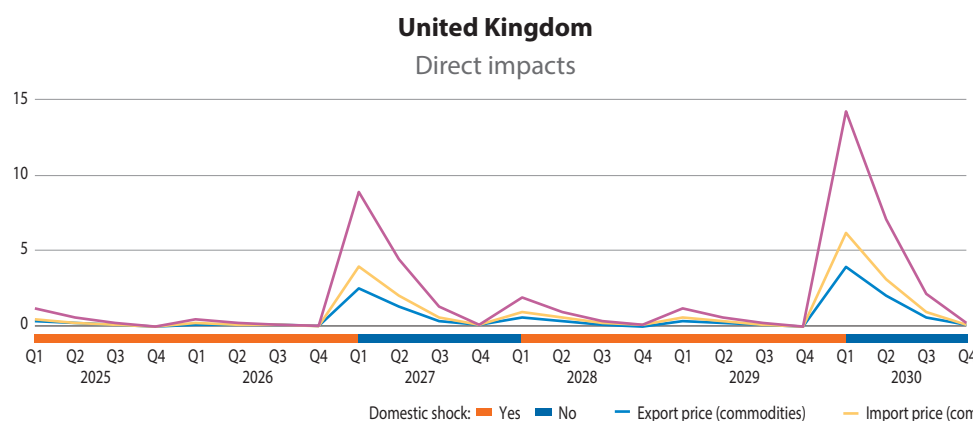
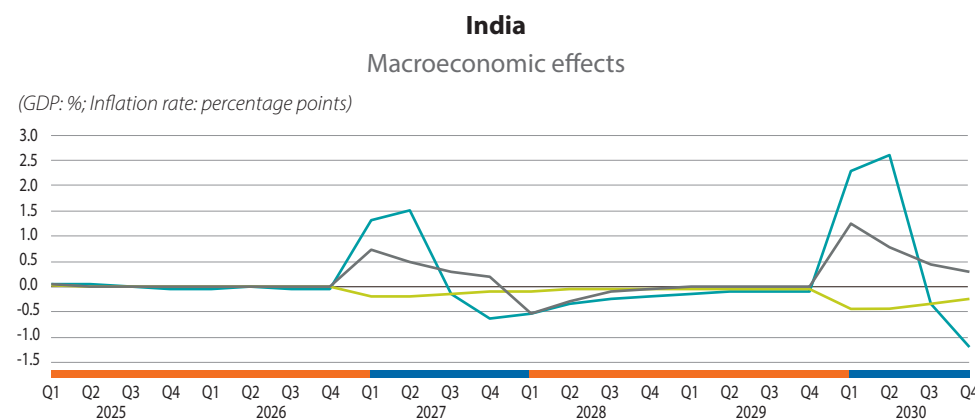
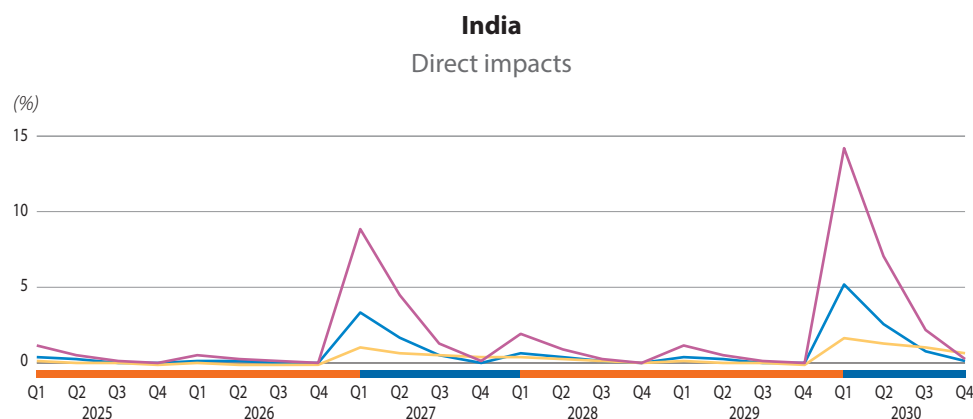


Note: Impacts of a global scenario, modelling heatwaves in isolation, comparing the effects under rational and adaptive expectations for select regions. Occurrence of shocks follows the main 'El Niño' storyline, with years where a jurisdiction experiences a domestic shock denoted by orange bars underneath the charts.

Droughts decrease GDP and increase inflation, creating MP trade-offs

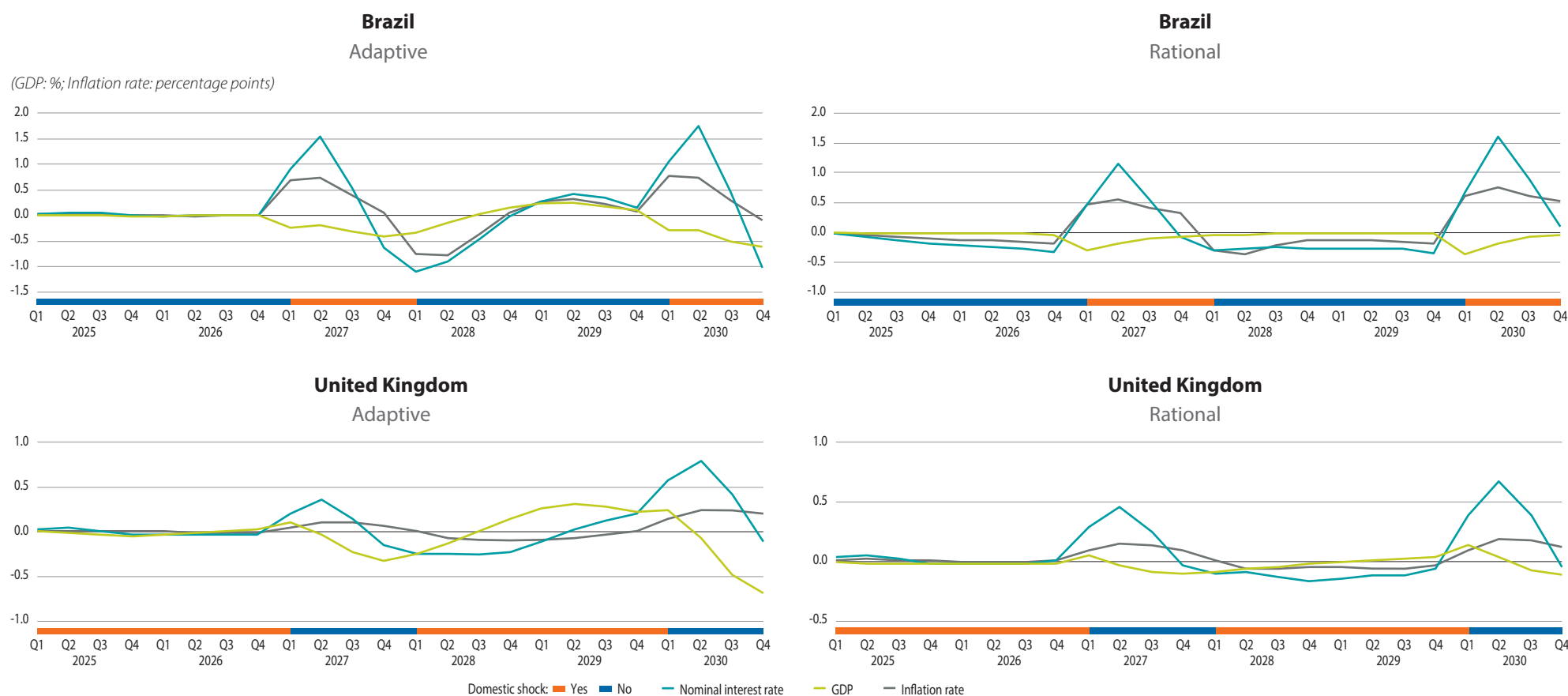
- Droughts are modelled as shocks to productive capacity in agriculture and through the corresponding impacts on global agricultural exports and prices.
- Declines in GDP from droughts are more likely to materialise alongside higher inflation, compared to impacts from heatwaves.
- International spillovers play an important role for some jurisdictions to the point that inflation may be more affected by international than domestic droughts.
- Co-occurring adverse impacts on output and prices can create a **monetary policy trade-off** for the central bank.
- When agents have adaptive expectations, inflationary pressures tend to manifest more strongly.

Effects of droughts manifest strongly through reduced agricultural commodities output and higher prices



Note: Impacts of a global scenario modelling droughts in isolation, showing direct shock impacts and the resulting macroeconomic effects for select regions. Occurrence of shocks follows the main 'El Niño' storyline, with years where a jurisdiction experiences a domestic shock denoted by orange bars underneath the charts.

Impacts on GDP and inflation from droughts can be stronger and more volatile when agents have adaptive expectations

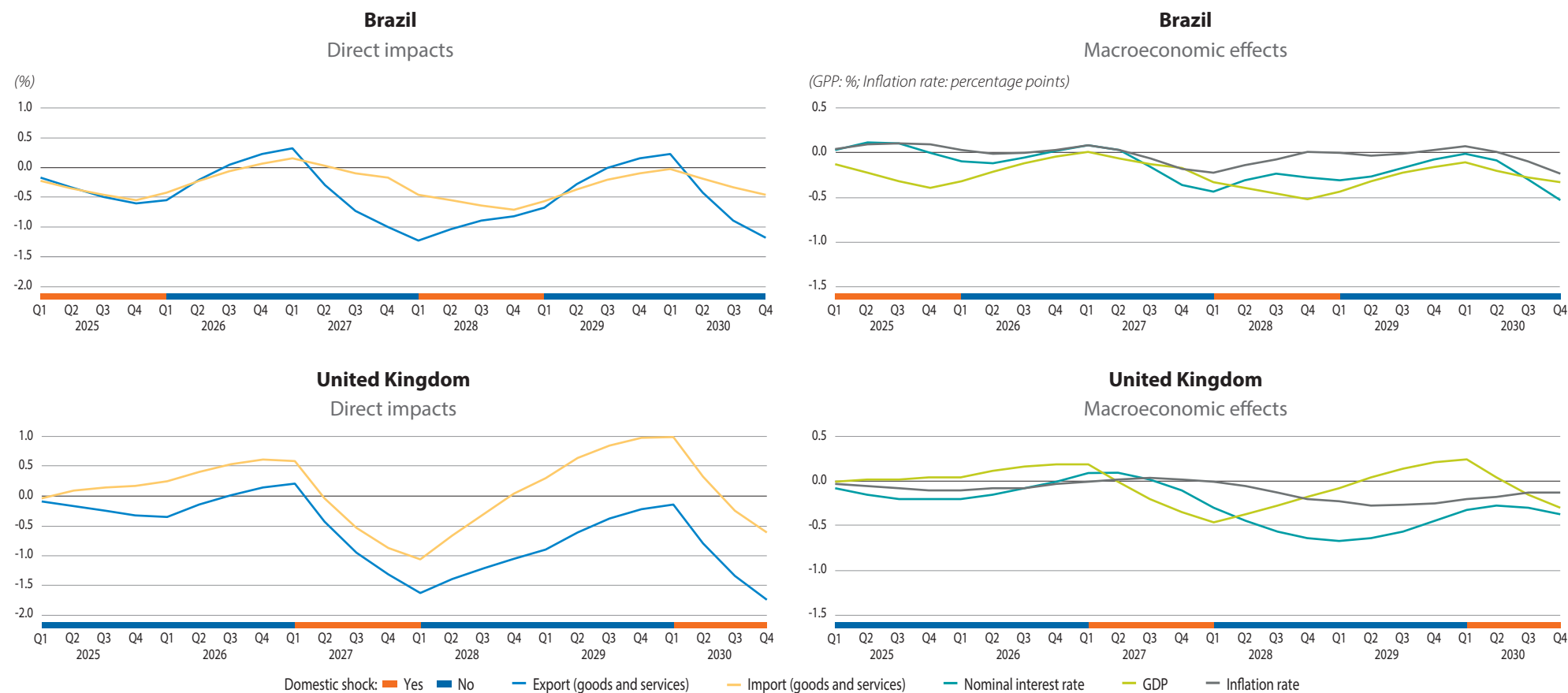


Note: Impacts of a global scenario modelling droughts in isolation, comparing the effects under rational and adaptive agent expectations for select regions. Occurrence of shocks follows the main 'El Niño' storyline, with years where a jurisdiction experiences a domestic shock denoted by orange bars underneath the charts.

Floods and cyclones in the model manifest primarily as negative demand shocks, generating deflationary pressures

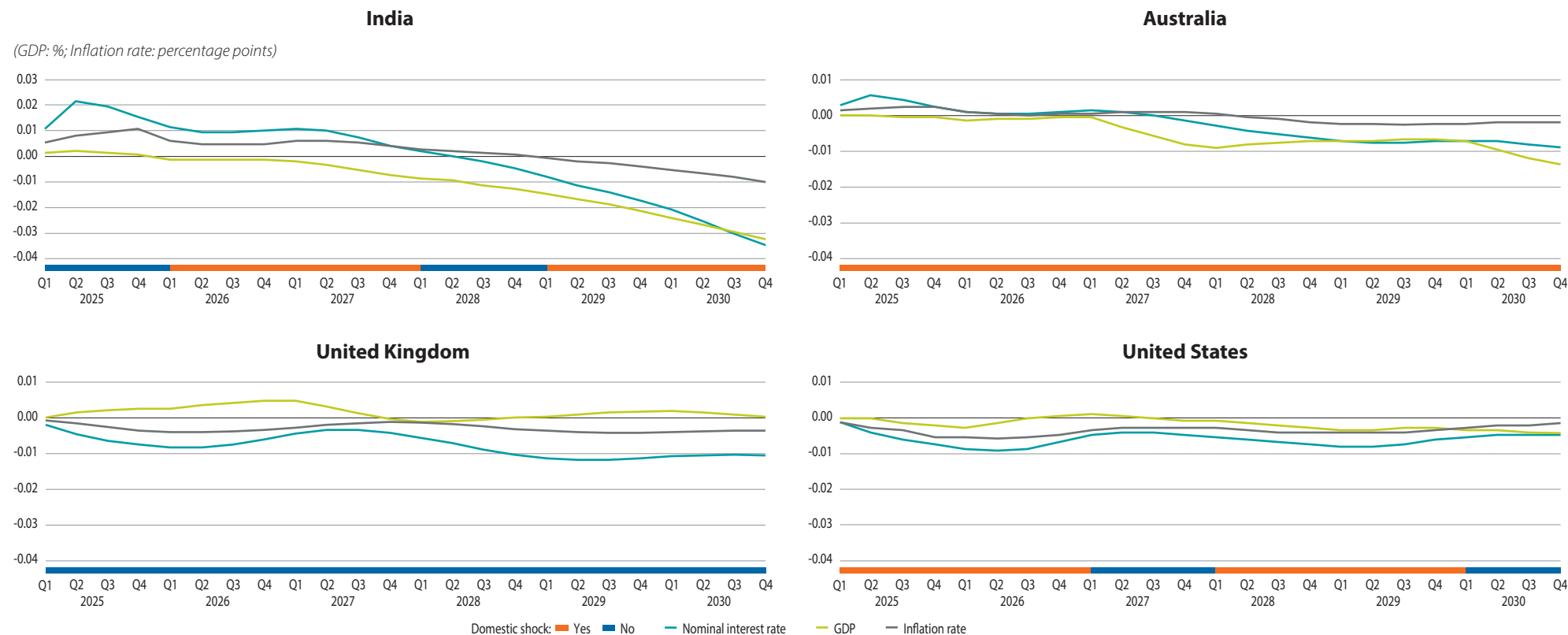
- Flood and cyclones are modelled as hits to the capital stock, proxied as increases in investment premia.
- Through this channel, floods and cyclones adversely impact demand in the model, pushing down on output and prices.
- Based on empirical literature, effects on EMDEs in these scenarios are additionally calibrated via a ready-reckoner (derived from Li, 2024) introducing an inflationary shock on impact.
- Note that socioeconomic and environmental characteristics of the affected area influence the relative and absolute strength of supply and demand effects, and the empirical literature offers examples of floods and cyclones generating inflationary impacts.

Floods hit exports, while adverse impacts on imports tend to reverse in post-shock recoveries



Note: Impacts of a global scenario modelling floods in isolation, showing shock impacts on trade and the macroeconomic effects for select regions. Occurrence of shocks follows the main 'El Niño' storyline, with years where a jurisdiction experiences a domestic shock denoted by orange bars underneath the charts.

Tropical cyclones transmit in the model in the same way as floods



Note: Macroeconomic impacts of a global scenario modelling cyclones in isolation, for select regions. Due to highly localised character, modelled aggregate impacts of cyclones are relatively small for large economies. Impacts on regions not directly affected (e.g. the UK) result from international spillovers. Occurrence of shocks follows the main 'El Niño' storyline, with years where a jurisdiction experiences a domestic shock denoted by orange bars underneath.

Notes

- Please see Box B in NGFS (2026), *Climate change and monetary policy strategy: a guide for central banks*, for further description of this modelling exercise and additional references.



NGFS
Secretariat