

Second World Bank – KDIS Conference

# Fiscal Policy, Economic Resilience, and Climate Shocks



**WORLD BANK GROUP**

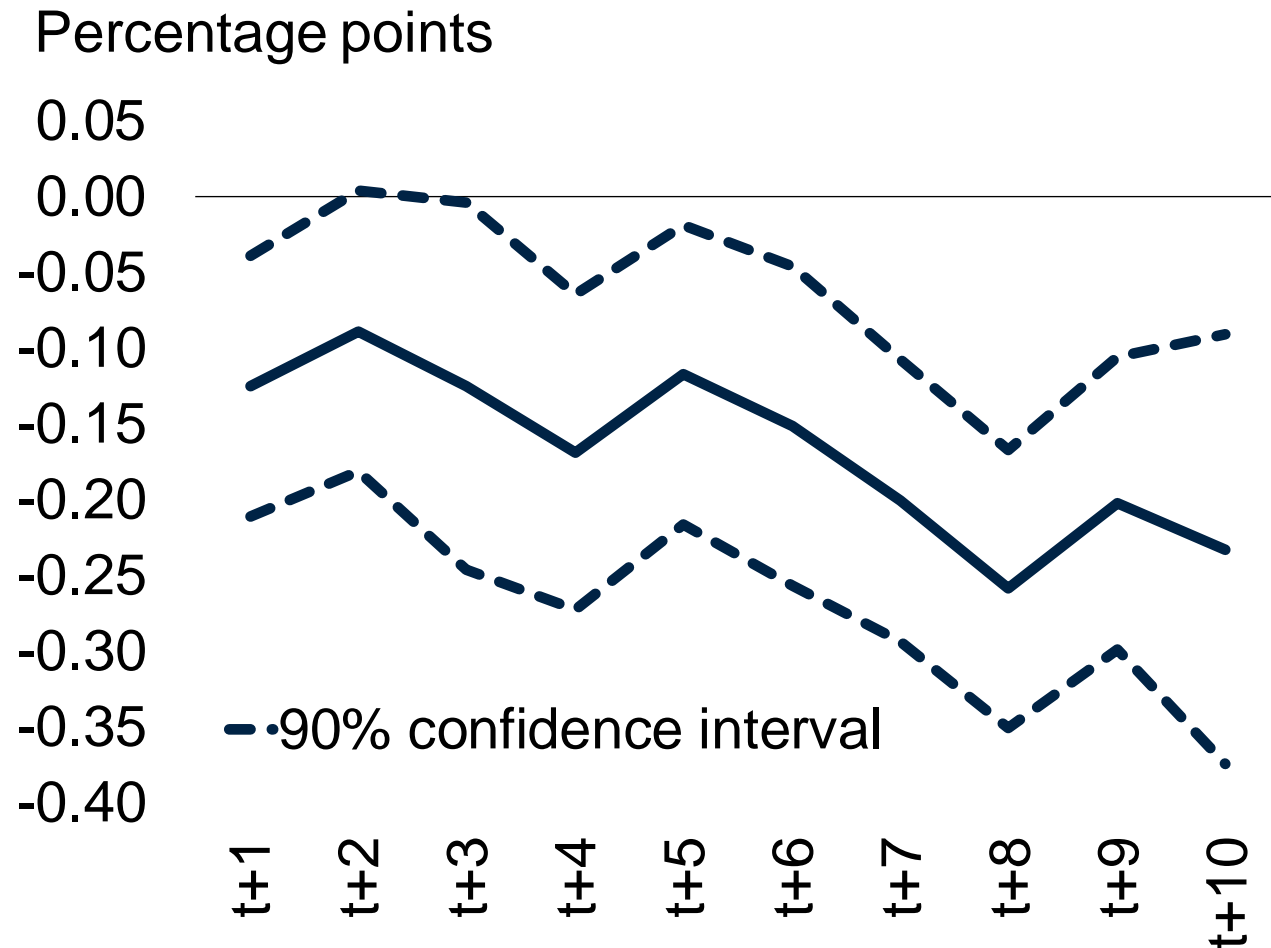
Macroeconomics, Trade & Investment

# Climate shock impacts on GDP - empirical estimates

- **Climate shocks**
  - operationalized as natural disasters (such as floods, drought, earthquakes, etc.) using EM-DAT
  - Projected to increase with climate change
- **More negative impacts in economies with constrained fiscal space**
  - proxied by high debt
  - procyclical policy
  - low tax revenue collection
  - less effective governments
- We also find that climate shocks tend to have larger impact in economies that had a negative output gap in the previous period, suggesting the possibility of cascading effects.

# Climate shocks have negative and long-lasting impacts on output

Impact of a natural disaster affecting 1 percent of the population on log real GDP per capita

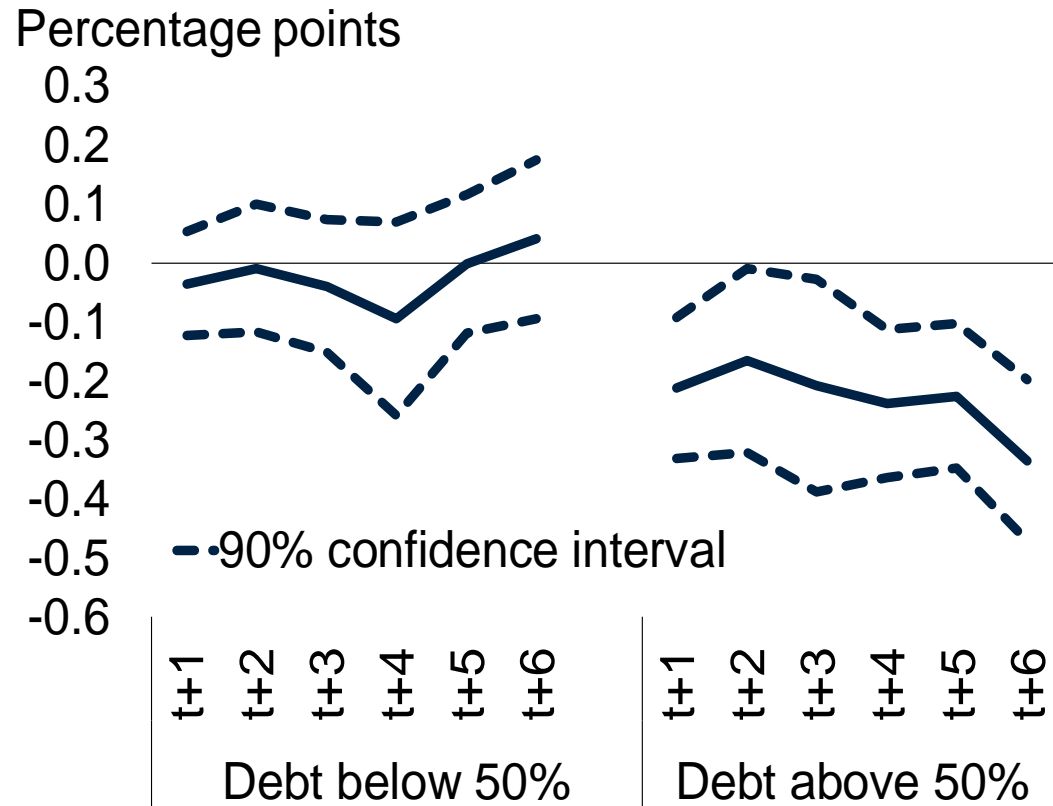


Sources: EM-DAT; International Monetary Fund; World Bank; Staff calculations.

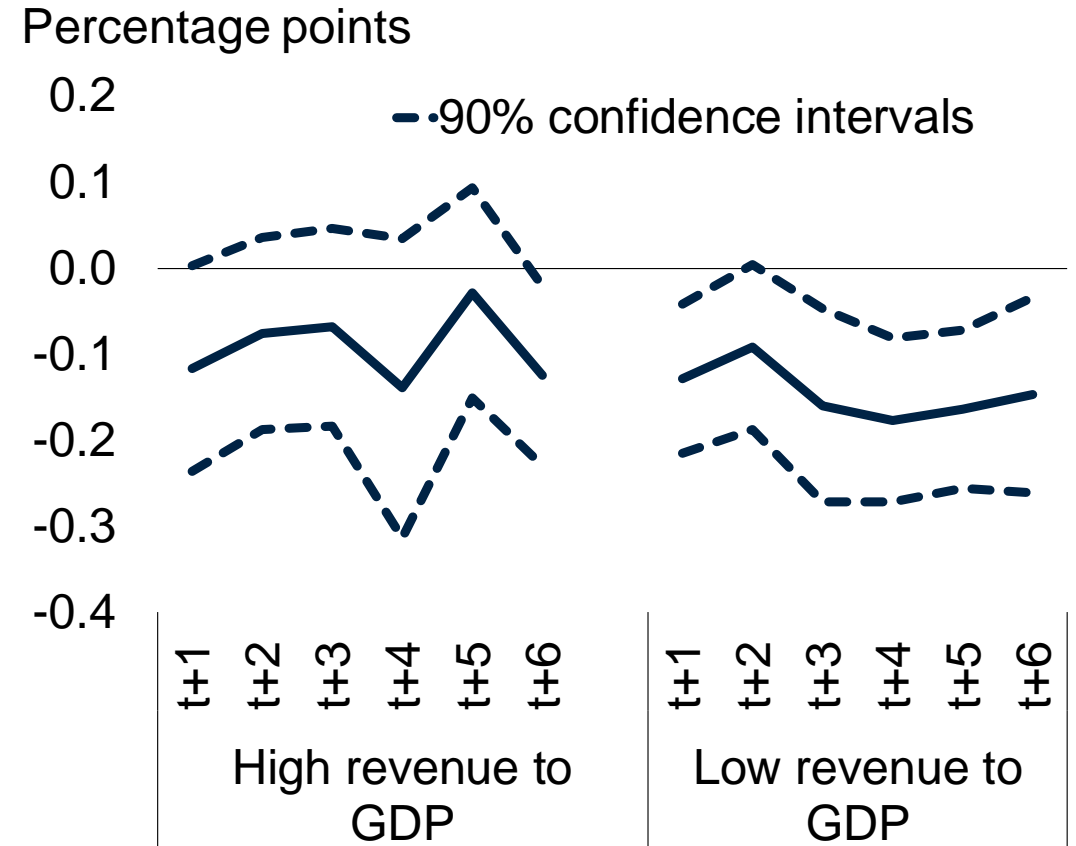
Note: Based on a panel regression model with country and time fixed effects on 3885 observations for 180 economies over 23 years. Climate shock identified using total affected and total deaths from EM-DAT.

# Higher public debt and lower revenues is associated with greater losses

IMPACT OF CLIMATE SHOCK ON LOG REAL GDP PER CAPITA



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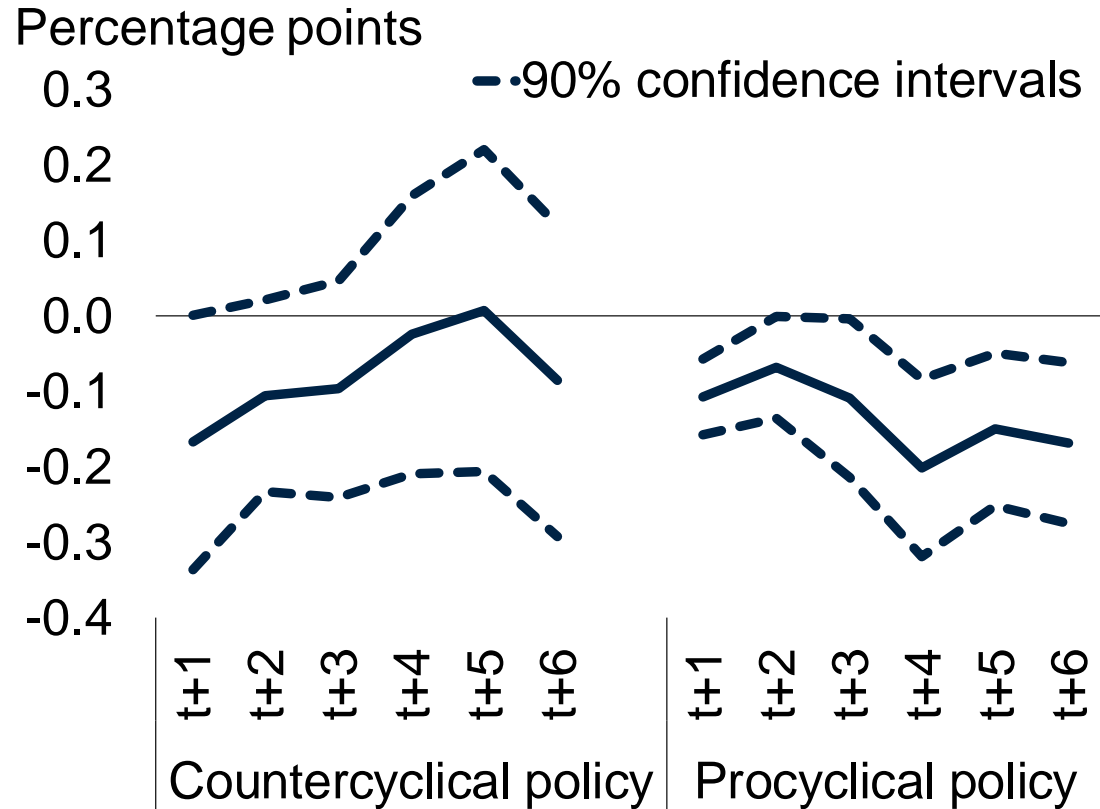


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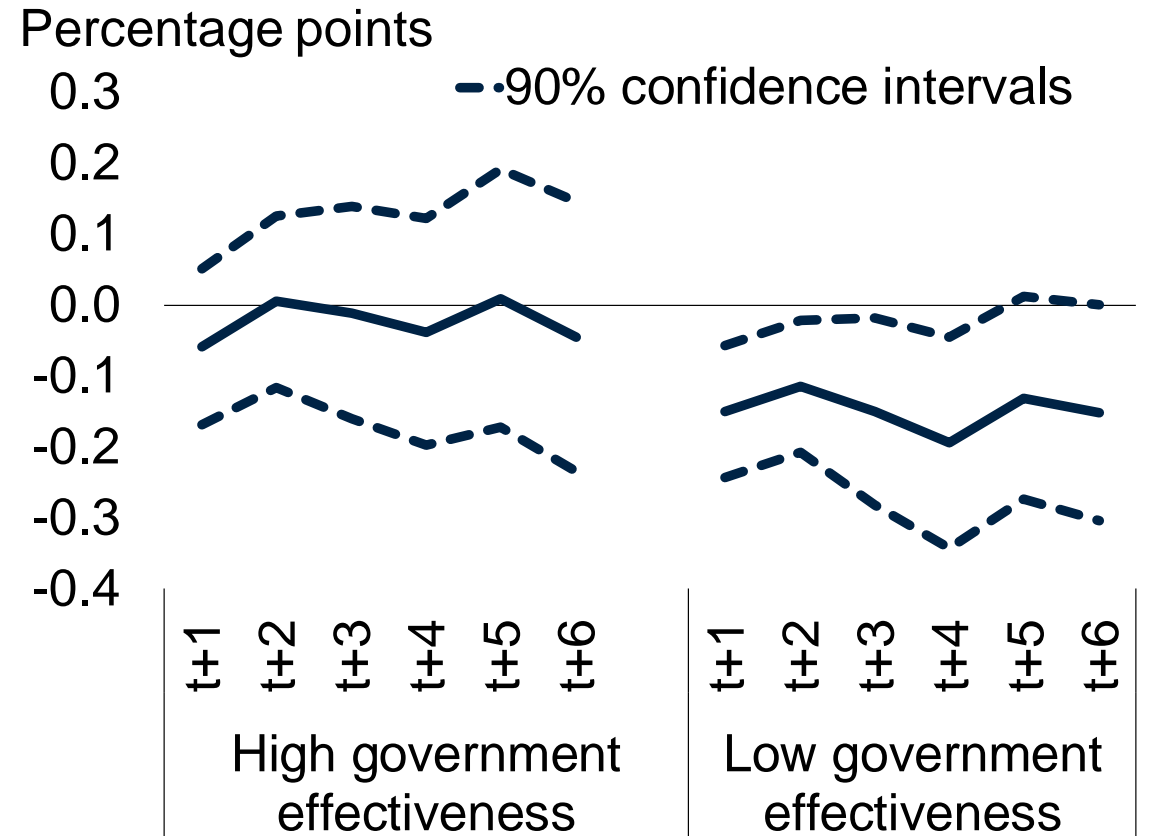
Note: Based on a non-linear panel regression model with country and time fixed effects. Climate shock refers to the number of people affected by natural disasters using data from EM-DAT and defined as a 1 percent of the population affected. Right: "High revenue to GDP" is that above the median.

# 'Bad' fiscal policy is associated with larger losses from climate shocks

IMPACT OF CLIMATE SHOCK ON LOG REAL GDP PER CAPITA



IMPACT OF CLIMATE SHOCK ON LOG REAL GDP PER CAPITA



Sources: EM-DAT; International Monetary Fund; World Bank; Staff calculations.

Note: Based on a non-linear panel regression model with country and time fixed effects. Climate shock refers to the number of people affected by natural disasters using data from EM-DAT and defined as a 1 percent of the population affected. Right: "High revenue to GDP" is that above the median.

# Macro-fiscal simulation of climate shocks

- **Small open island economy**, particularly vulnerable to external shocks and climate shocks to test threshold and compound macroeconomic risks.
- **World Bank's macroeconomic model**: MFMod, a structural econometric model, representation of an economy's flow of funds, sectoral interactions, and trade dynamics. CCDR application forecasting climate change impacts on development paths, exploring low-carbon transitions, and policy recommendations for resilience using latest economic and climate data.
- **The importance of fiscal policy** in mitigating risks by extending this analysis. In particular, we ask
  - how the severity of climate risks can have non-linear impacts on macroeconomic performance,
  - how the presence of other economic risks (e.g. shocks to trading partners, internal business cycle fluctuations, or shocks in currency markets) compounds the risks posed by climate change, and
  - how simple adjustments to fiscal policy can ameliorate the impacts of climate risks and increase economic resilience.
- Model setup up follows Hallegatte et al. (2022) who focus on monetary policy.

# Threshold and compound risks in MFMOD

- Shock to capital stock have long-lasting effects on potential output and GDP even with proactive policy.
- Policy matters
  - Which instruments to adjust and how?

| <i>5% climate shock: no policy</i> | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|------------------------------------|------|------|------|------|------|------|------|------|------|
| <b>Economic Activity</b>           |      |      |      |      |      |      |      |      |      |
| GDP                                | 0.0  | -1.9 | -2.4 | -2.7 | -2.9 | -3.0 | -3.1 | -2.0 | -1.4 |
| <b>Supply Side</b>                 |      |      |      |      |      |      |      |      |      |
| Potential GDP                      | 0.0  | -3.0 | -3.0 | -2.9 | -2.9 | -2.8 | -2.8 | -2.0 | -1.4 |
| Capital stock                      | -5.0 | -4.9 | -4.8 | -4.7 | -4.7 | -4.6 | -4.6 | -3.3 | -2.3 |

| <i>10% climate shock: no policy</i> | 2024  | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|-------------------------------------|-------|------|------|------|------|------|------|------|------|
| <b>Economic Activity</b>            |       |      |      |      |      |      |      |      |      |
| GDP                                 | 0.0   | -3.8 | -4.8 | -5.4 | -5.8 | -6.1 | -6.1 | -4.1 | -2.9 |
| <b>Supply Side</b>                  |       |      |      |      |      |      |      |      |      |
| Potential GDP                       | 0.0   | -6.1 | -5.9 | -5.8 | -5.7 | -5.7 | -5.6 | -4.1 | -2.9 |
| Capital stock                       | -10.0 | -9.7 | -9.5 | -9.4 | -9.3 | -9.2 | -9.0 | -6.5 | -4.6 |

| <i>5% climate shock: policy</i> | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|---------------------------------|------|------|------|------|------|------|------|------|------|
| <b>Economic Activity</b>        |      |      |      |      |      |      |      |      |      |
| GDP                             | 0.0  | -1.9 | -2.3 | -2.4 | -2.4 | -2.3 | -2.2 | -1.3 | -0.9 |
| <b>Supply Side</b>              |      |      |      |      |      |      |      |      |      |
| Potential GDP                   | 0.0  | -3.0 | -2.8 | -2.5 | -2.3 | -2.0 | -1.9 | -1.3 | -0.9 |
| Capital stock                   | -5.0 | -4.5 | -4.1 | -3.7 | -3.4 | -3.1 | -3.1 | -2.1 | -1.5 |

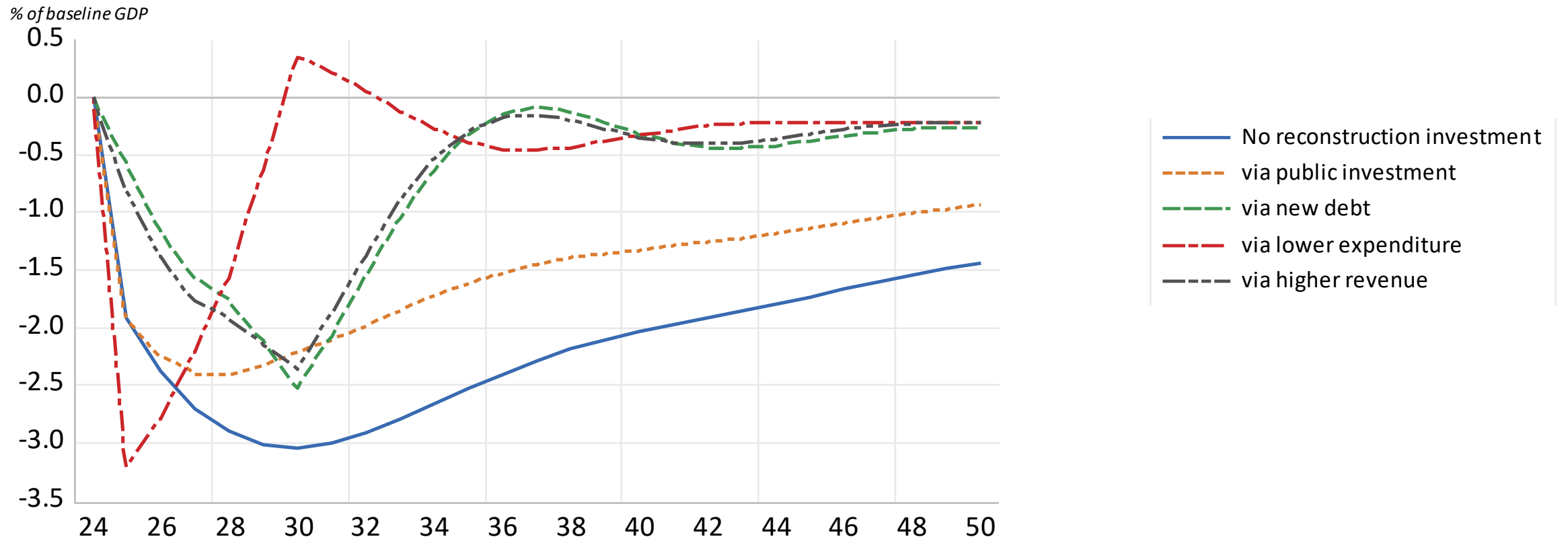
| <i>10% climate shock: policy</i> | 2024  | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|----------------------------------|-------|------|------|------|------|------|------|------|------|
| <b>Economic Activity</b>         |       |      |      |      |      |      |      |      |      |
| GDP                              | 0.0   | -3.8 | -4.6 | -5.1 | -5.4 | -5.4 | -5.3 | -2.8 | -2.0 |
| <b>Supply Side</b>               |       |      |      |      |      |      |      |      |      |
| Potential GDP                    | 0.0   | -6.1 | -5.7 | -5.4 | -5.1 | -4.9 | -4.6 | -2.8 | -2.0 |
| Capital stock                    | -10.0 | -9.4 | -8.9 | -8.4 | -8.0 | -7.6 | -7.2 | -4.4 | -3.2 |

# Policy instruments

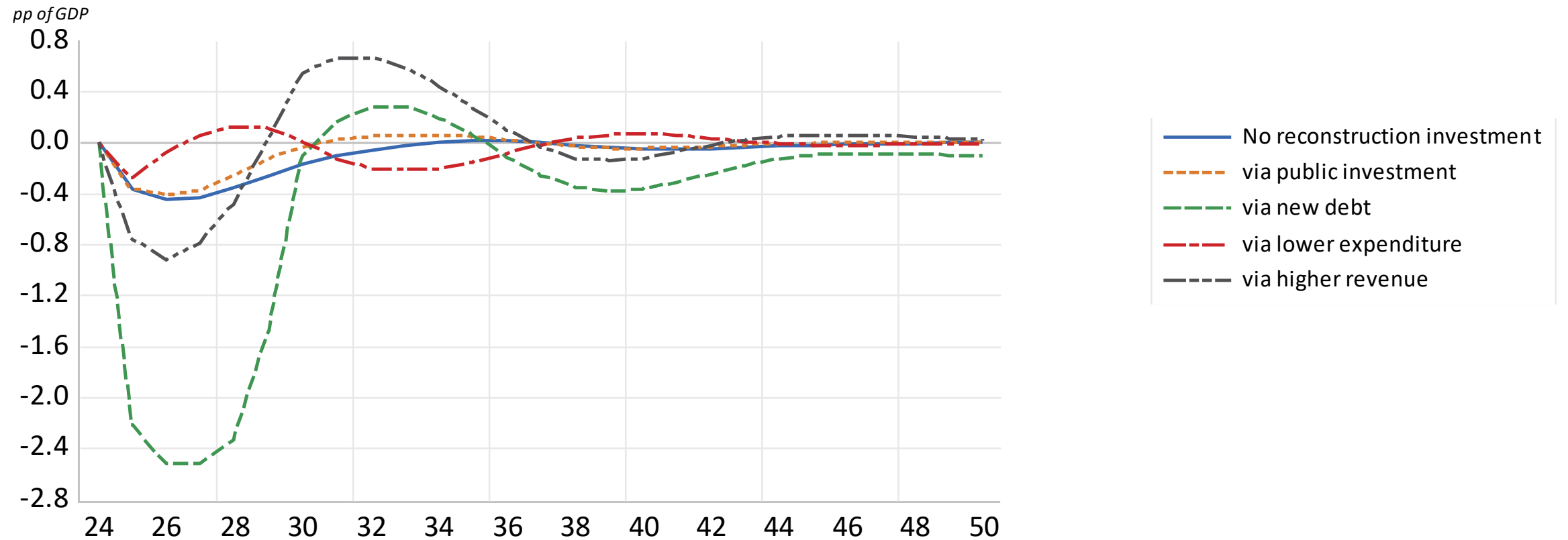
- **Disasters destructs capital** stock which needs to be repaired to restore productivity.
- **Lingering effects of missed capital formation** for productive capacity of economy, slow catching-up. Competing demands for capital investment: new or reconstruction.
- We test various way of funding reconstruction efforts:
  - No investment
  - 50% of public investment toward reconstruction (Hallegatte et al. baseline)
  - Same level of reconstruction investment via increases in debt
  - Same level of reconstruction investment via reductions in other expenditure
  - Same level of reconstruction investment via increases in revenue



# GDP under a 5% shock to capital stock and various policy scenarios



# Fiscal balance under a 5% shock and various policy scenarios



# Strategies for Enhancing Fiscal Resilience

**Economic Vulnerability:** Climate-related disasters exacerbate existing economic challenges in developing countries.

**Role of Fiscal Policy:** Econometric results underscore the critical importance of fiscal policy in mitigating the adverse economic impacts of climate disasters. Model simulation illustrates the effectiveness of fiscal policy even in the absence of adaptation and preparedness

- 1. Prudent Fiscal Management:** Effective fiscal policies that manage debt levels and mobilize additional revenue to create fiscal buffers. This includes implementing binding fiscal rules and improving tax policy, administration, and legal frameworks.
- 2. Countercyclical Fiscal Strategies:** Economies that employ countercyclical government spending policies face smaller and shorter negative impacts from climate shocks compared to those with procyclical spending policies.
- 3. Fiscal Instruments and Buffers:** Governments should establish contingency reserves and natural disaster funds, use catastrophe bonds, and other insurance mechanisms to manage the financial impact of natural disasters, ensuring flexibility and preparedness for increased frequency and severity of climate events.
- 4. Government Effectiveness:** Strengthening government effectiveness is crucial in mitigating the negative effects of climate shocks. Effective fiscal policy formulation, implementation, and credible government commitments enhance resilience, with medium-term expenditure frameworks aligning spending with strategic goals to address future climate risks.

