POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

Impacts of extreme weather events on economic growth

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Econometric model and data

$$g_{i,t} = g^0_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Variables

- $g^0_{i,t}$: fixed-effects – unperturbed growth path
- $P_{i,t-l}$: share of exposed people to extremes
- β_l: estimation points (we represent the cumulative response: $\Omega_l = \sum \beta_l$)
- $g_{i,t} = \frac{Y_{i,t} - Y_{i,t-1}}{Y_{i,t-1}}$: Growth rate of GDPpc $Y_{i,t}$
- $g_{i,t} = \sum_{s \in S} \omega^s_{i,t} g^{Y_s}_{i,t} = \sum_{s \in S} \tilde{g}^{Y_s}_{i,t}$: GDPpc growth as a sum of weighted sectoral growths

Data

- Exposed people to tropical cyclones: TCE-DAT, Geiger et al. (2018).
- Exposed people to fluvial floods: ISIMIP2a, Willner et al. (2018).
- Macroeconomic data: (Per capita) GDP, national income identity components, sectors -- United Nations Statistical Division.
- Data: 1971 - 2010

Estimation procedure

- Time lags $L_{max} = 15$.
- Robust regression to control for outliers.
- Regression on GDPpc growth.
- Weighted and unweighted regressions on components: $\tilde{g}^{Y_s}_{i,t}$ and $g^{Y_s}_{i,t}$.

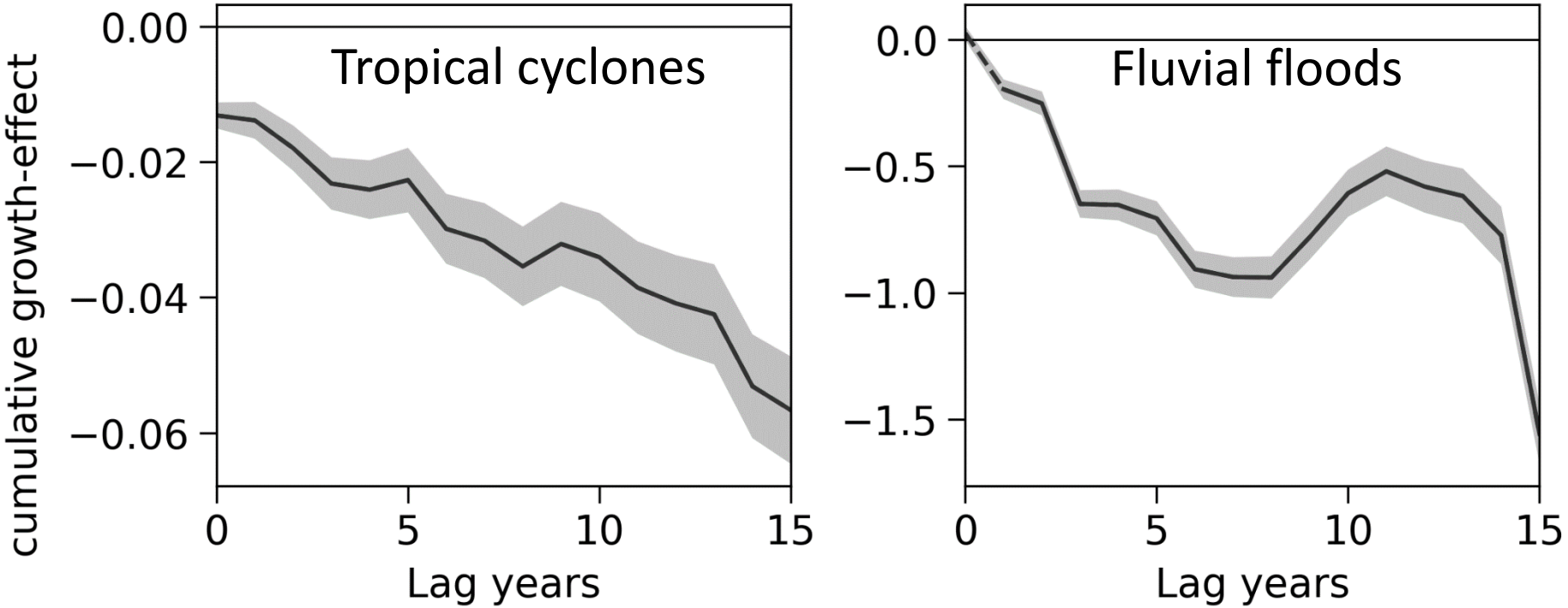
Growth impacts of tropical cyclones and fluvial floods

Growth regression

$$g_{i,t} = g^0_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Unperturbed growth path

Impacts of extremes



- Tropical cyclones and fluvial flood have negative and persistent growth impacts
  → Contradicts neoclassical growth theory

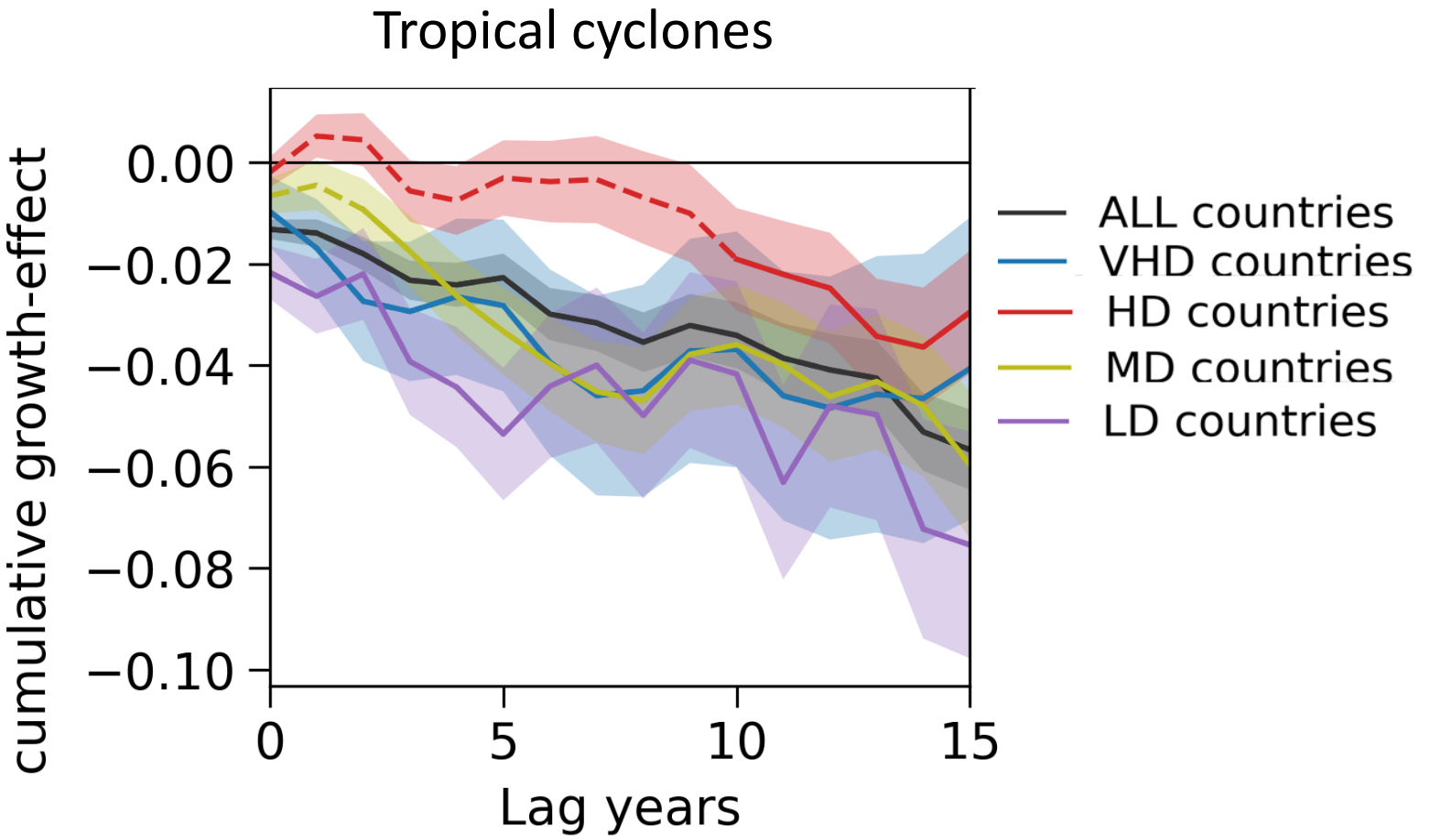
Growth impacts of tropical cyclones and development levels

Growth regression

$$g_{i,t} = g^0_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Unperturbed growth path

Impacts of extremes



- Tropical cyclones have negative and persistent growth impacts
  → Contradicts neoclassical growth theory
- Development cannot always protect against growth losses

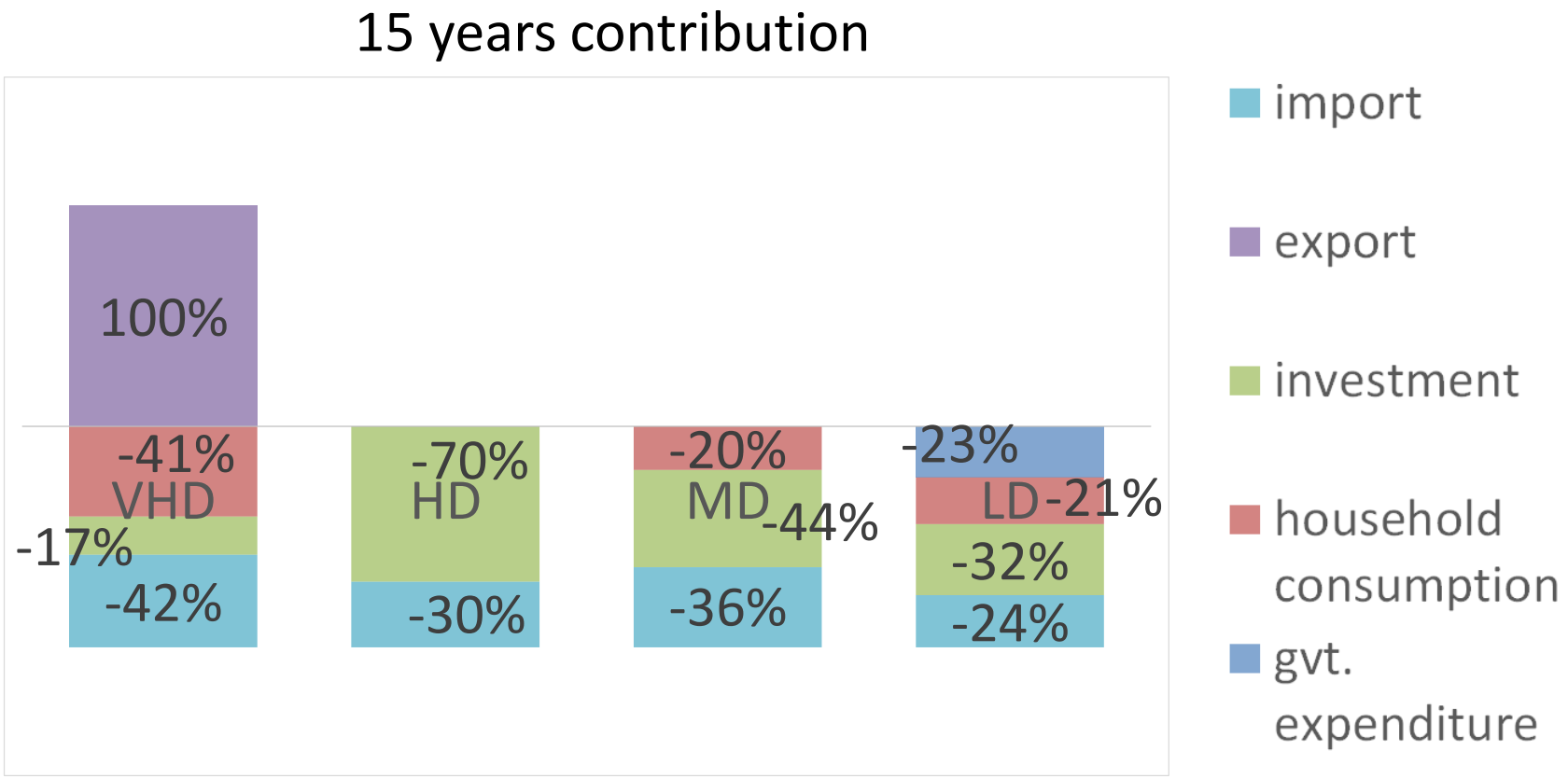
Growth impacts of tropical cyclones: contribution of income components

Growth regression

$$g_{i,t} = g^0_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Unperturbed growth path

Impacts of extremes



- No investment recovery in the long-term.
  - → Contradicts neoclassical growth theory: investment does not push up economic recovery.
- Investment and household consumption are main drivers of economic growth decline.

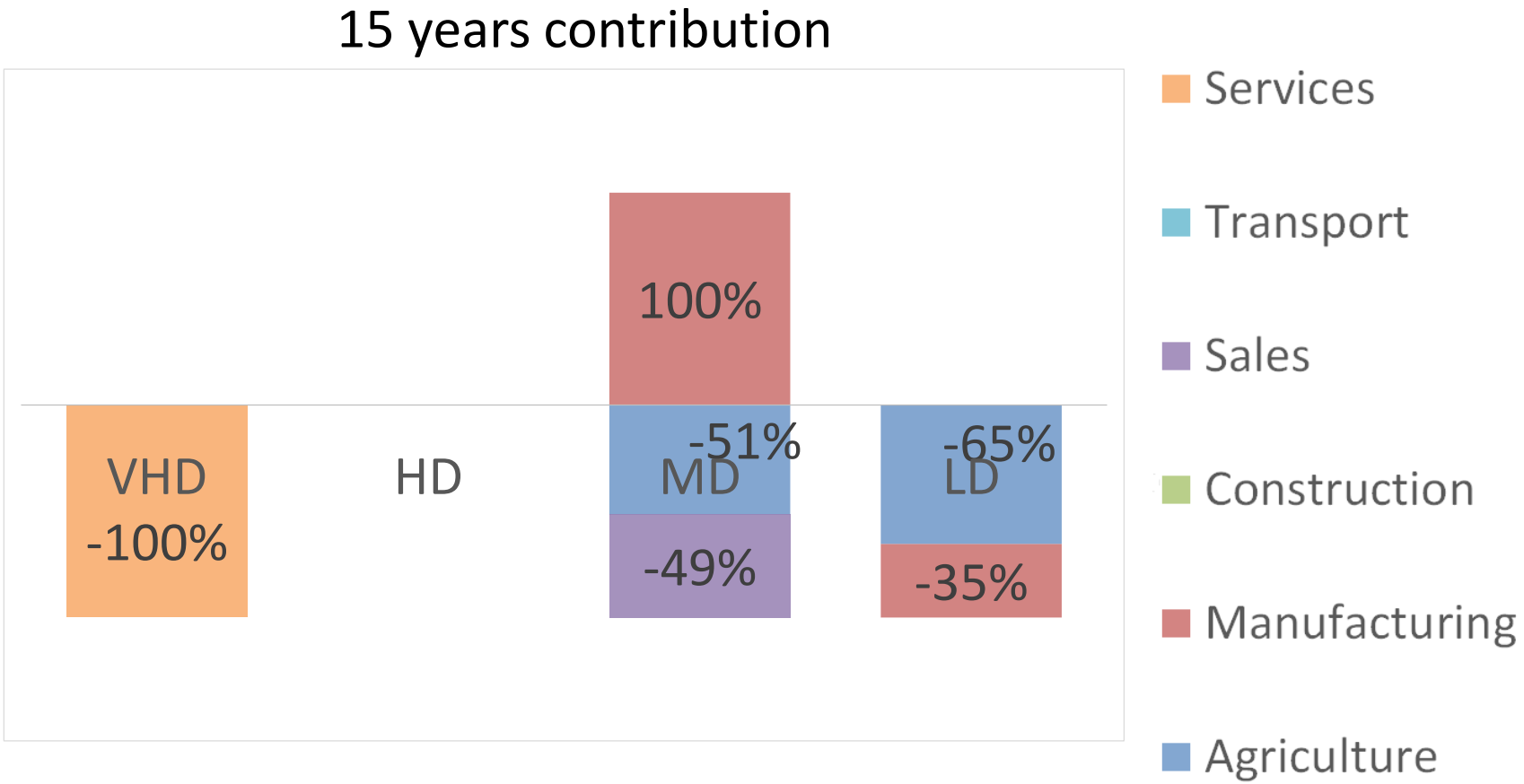
Growth impacts of tropical cyclones: contribution of economic sectors

Growth regression

$$g_{i,t} = g^0_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Unperturbed growth path

Impacts of extremes



- Agriculture is main driver of economic growth decline in developing countries.

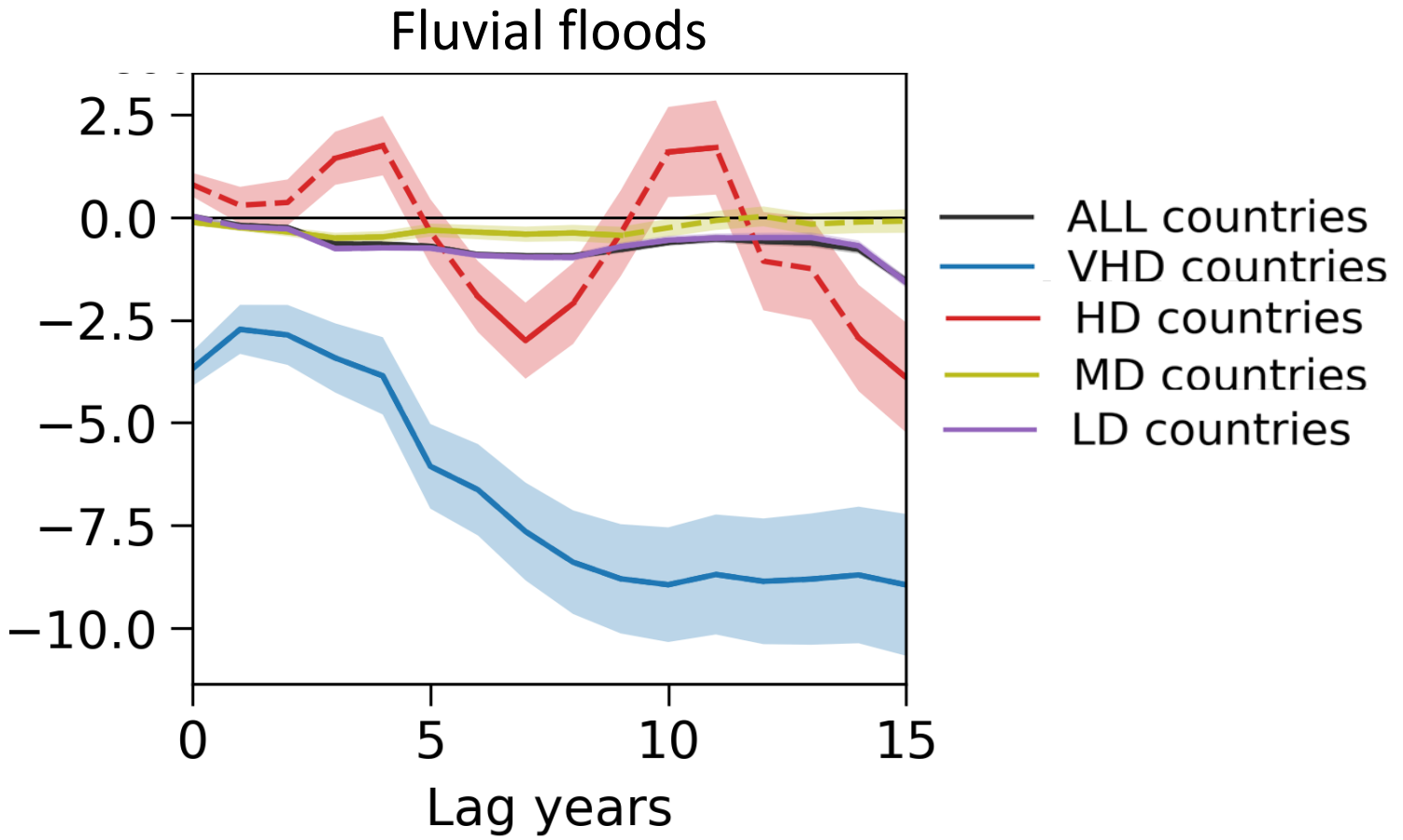
Growth impacts of fluvial floods and development levels

Growth regression

$$g_{i,t} = g^0_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Unperturbed growth path

Impacts of extremes



- Fluvial flood have negative and persistent growth impacts
  → Contradicts neoclassical growth theory
- Development cannot always protect against growth losses

Growth impacts of fluvial floods: contribution of income components

Growth regression

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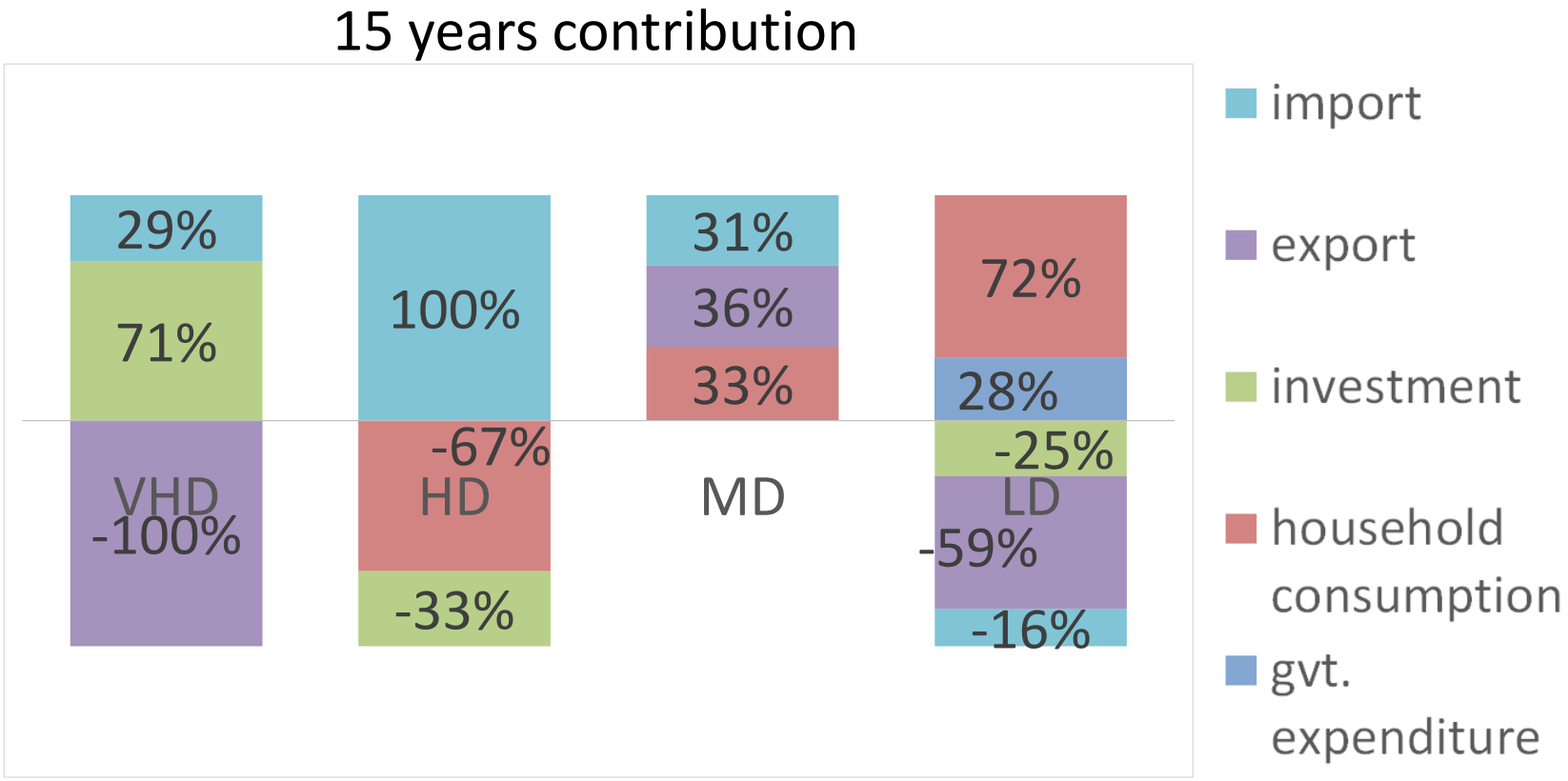
Unperturbed growth path

Impacts of extremes



- No investment recovery in the long-term.
  - → Contradicts neoclassical growth theory: investment does not push up economic recovery.
- Investment, household consumption and exports are main drivers of economic growth.

decline.

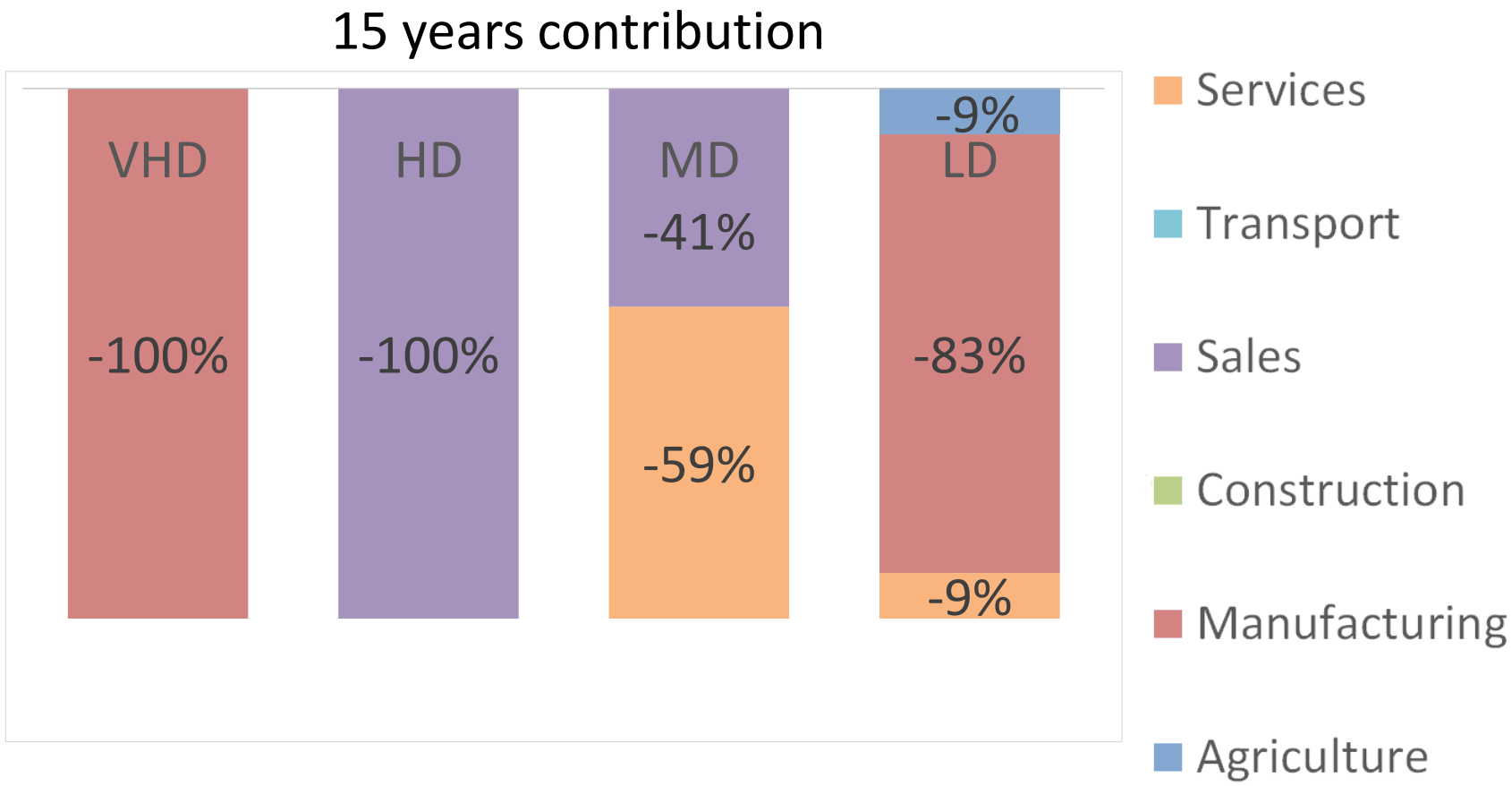
Growth impacts of fluvial floods: contribution of economic sectors

Growth regression

$$g_{i,t} = g^{0}_{i,t} + \sum_{l=0}^{L_{max}} \beta_l P_{i,t-l}$$

Unperturbed growth path

Impacts of extremes



- Manufacturing, sales and services are the main transmission channels of growth decline.
- Agriculture is a driver of economic growth decline in the least developed countries.

Summary

- Tropical cyclones and fluvial floods have negative and long-term persistent effects on economic growth.
- Development does not protect against weather extremes impacts.
- Investment can not push up the economic recovery in the aftermath of weather extremes.
- Investment, household consumption and international trade are the main drivers of economic growth decline.