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Implications of climate change adaptation for public finance: A case study for Austria

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Research Agenda

- Elicit which **climate adaptation cost categories** are **budgetary significant**
- Identify **adaptation needs and costs for public authorities** in Austria at different governance levels
- Explore **adaptation cost dynamics** (mid and long term)
- Estimate the **macroeconomic effects** of public adaptation
- Identify **synergies and potential trade-offs between public and private adaptation**

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PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT
IIASA International Institute for Applied Systems Analysis
AIT AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY

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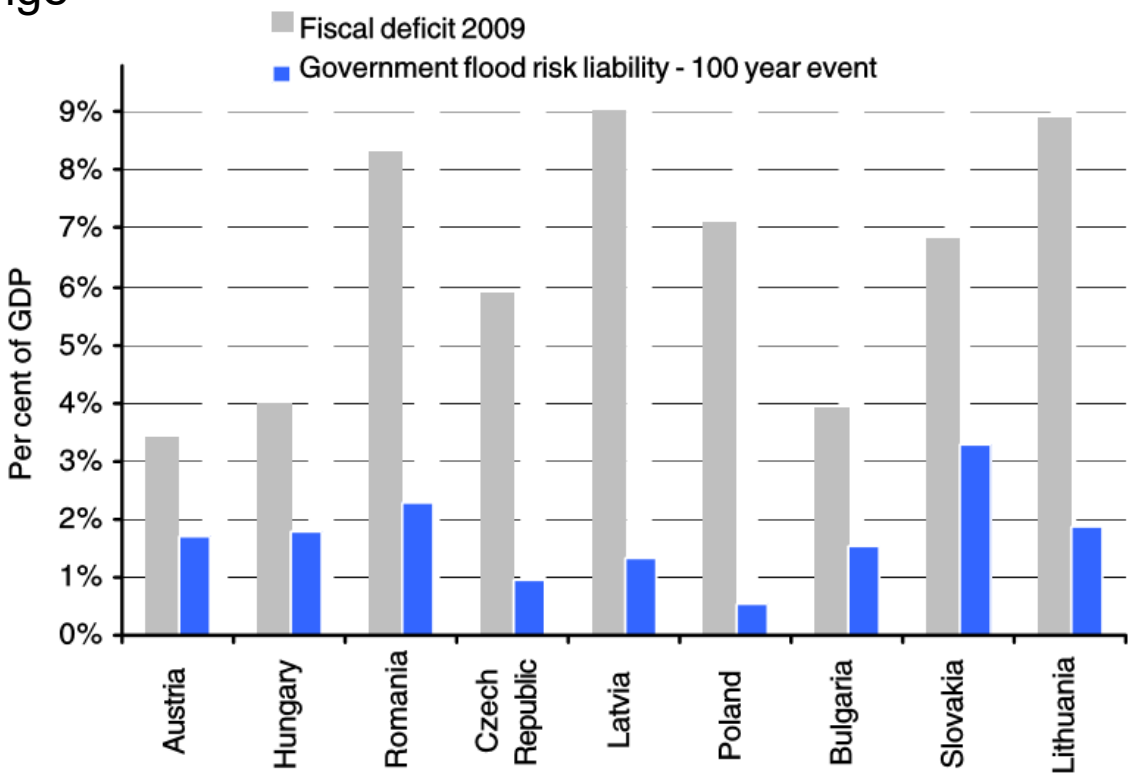
Introduction

- **Context of national study**
  - Long term budget forecast (by Federal Ministry of Finance)
    - Demographic change
    - Climate change



(Mechler et al., 2010)

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Methodology

Climate change impacts and adaptation in a national framework

- 12 “impact fields”
  - According to Austria’s National Adaptation Strategy
  - Detailed sectoral analyses (bottom-up)
- Consistent scenario definitions
  - Shared Socioeconomic Pathway (SSP) developed for all impact fields
  - Consistent climate scenario(s): Ø 2016-2045 and Ø 2036-2065
- CGE evaluation
  - Feed in results from sectoral analyses (10 impact fields)
- Compare **Baseline scenario** (no climate change but socioeconomic development) to **Climate Change scenario**

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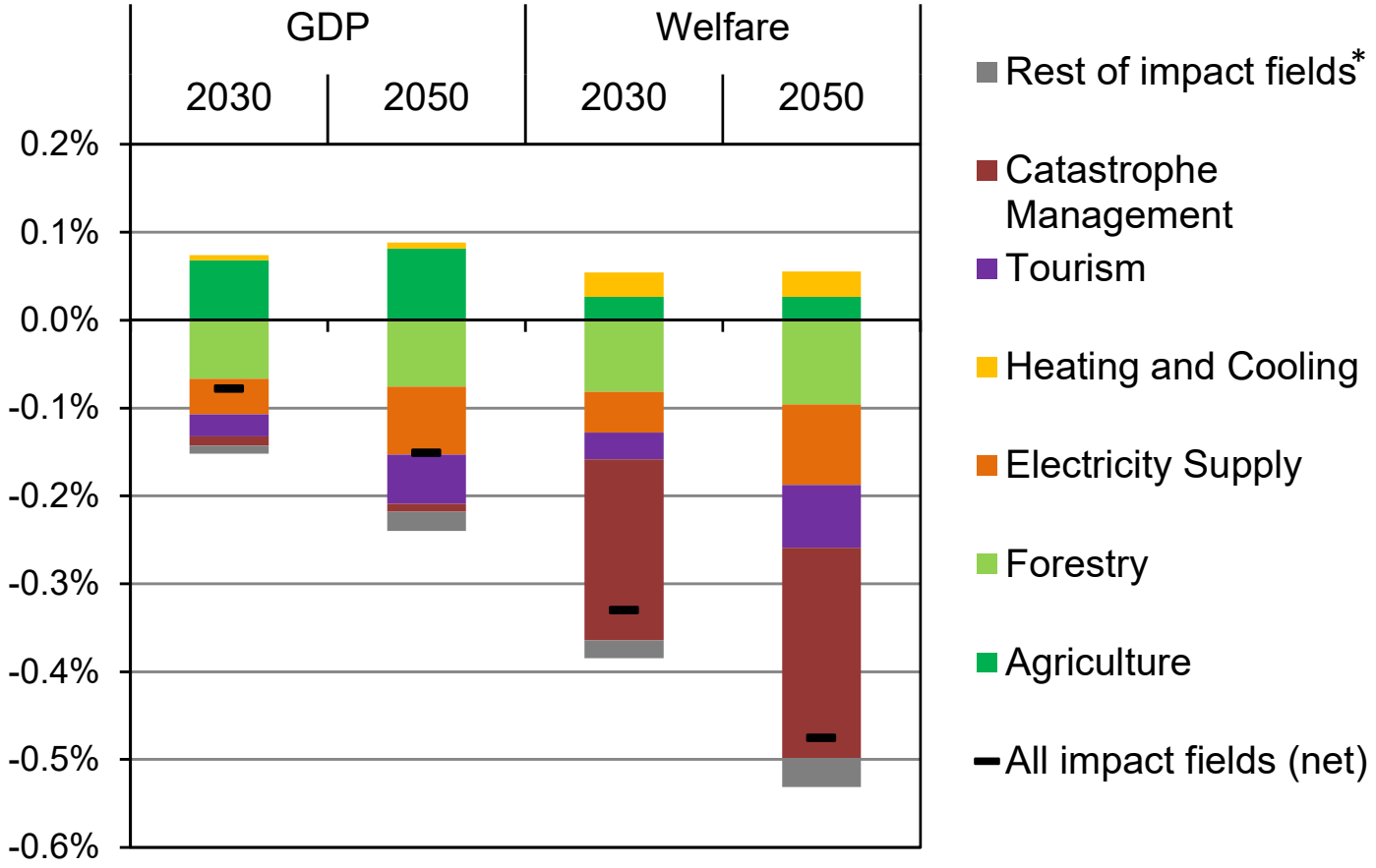
Climate change impacts in Austria

- Ø 2036-2065: GDP -0.15%; welfare -0.48% (relative to Baseline)



* Rest of impact fields: Transport, Manufacturing and Trade, Water Supply and Sanitation, Cities and Urban Green.

Steininger et al. (2016); Bachner et al. (2015)

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Climate change impacts in Austria

Impact Field	Impact chains	% GDP 2050	% Welfare 2050
Agriculture	Changed crop productivity of main crops and grassland due to changes in temperature and precipitation	+0.08%	+0.03%
Forestry	**Changed yield in commercial forests** (less biomass productivity, bark beetle disturbances); reduced protection functionality of **protection forests**	-0.08%	-0.10%
Buildings: Heating and Cooling	Increased **cooling energy demand** in summer, decreased **heating energy demand** in winter	+0.01%	+0.03%
Electricity	Change in **hydro, wind and PV ge**neration potential; lower availability of **cooling water** for thermal/nuclear plants, change **in generation mix**, reduction in **reliability of the electricity system**	-0.08%	-0.09%
Catastrophe Management	**Building damages** due to riverine flooding	-0.01%	-0.24%
Tourism	Changes in **winter and summer tourism demand**	-0.06%	-0.07%
Rest		-0.02%	-0.03%
Net effect		**-0.15%**	**-0.48%**

Steininger et al. (2016); Bachner et al. (2015)

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Climate change adaptation in Austria

Impact Field	Adaptation scenario assumptions	Data
Catastrophe Management	– **protection of all areas against a future 100-year event** – **Current adaptation deficit** included – Adaptation costs for upgrading dikes – **Average benefit-cost ratio of 1.74** – **Investment volume: 25% of expected annual damage**	BASE project (Jeuken et al. 2015)

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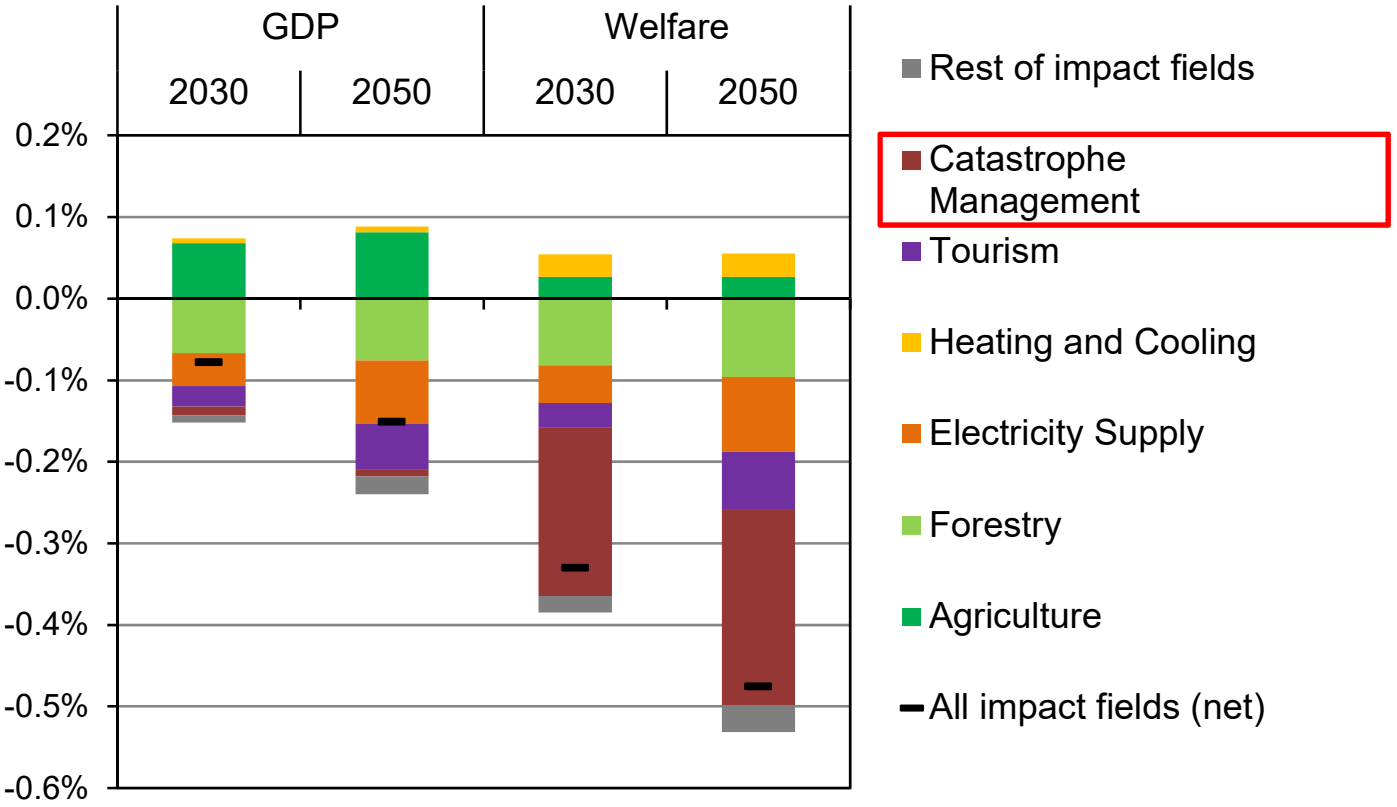
Catastrophe Management



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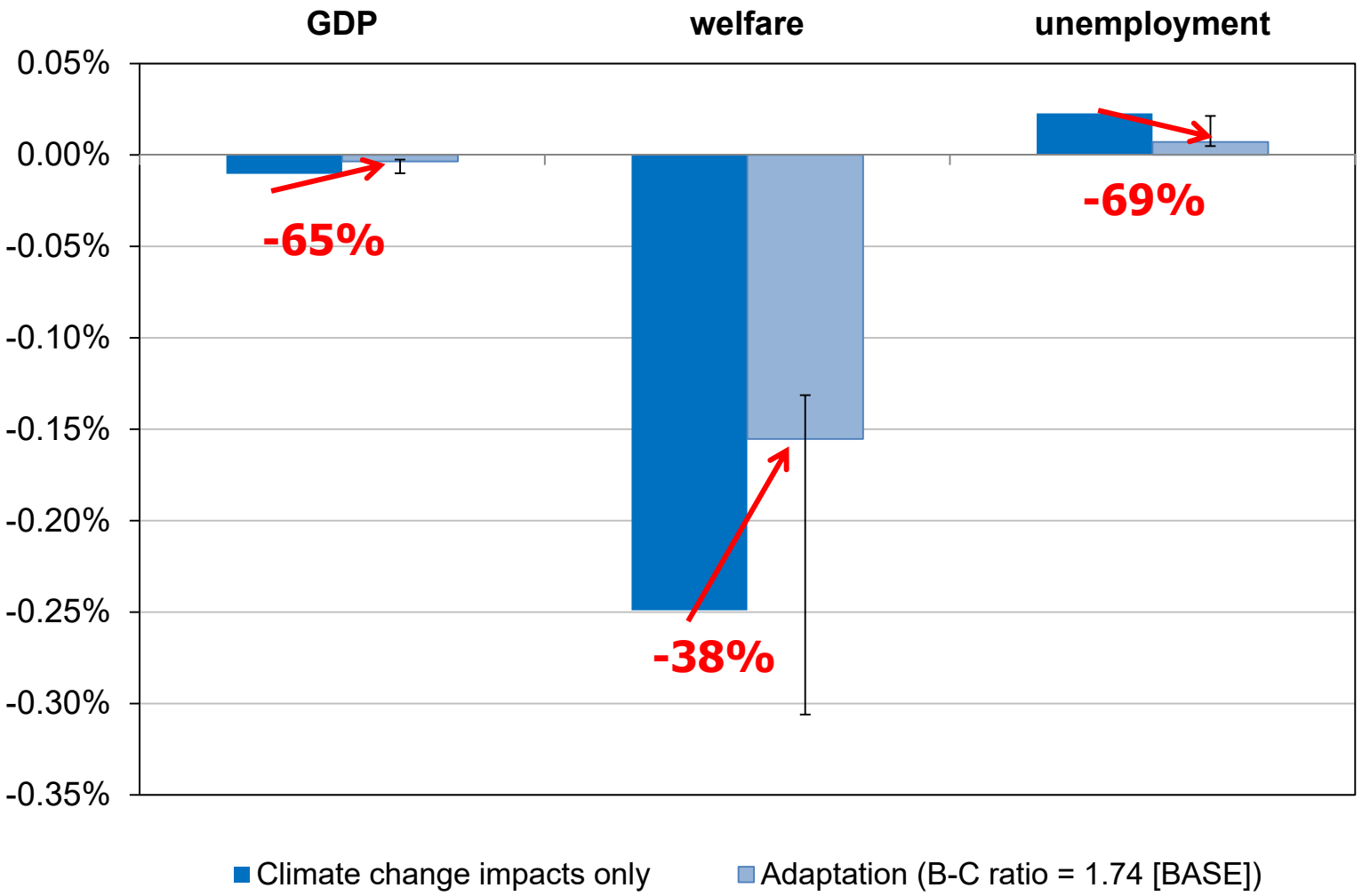
Catastrophe Management



Note: Error bars stand for different assumptions on effectiveness (10% to 200% B-C ratio)

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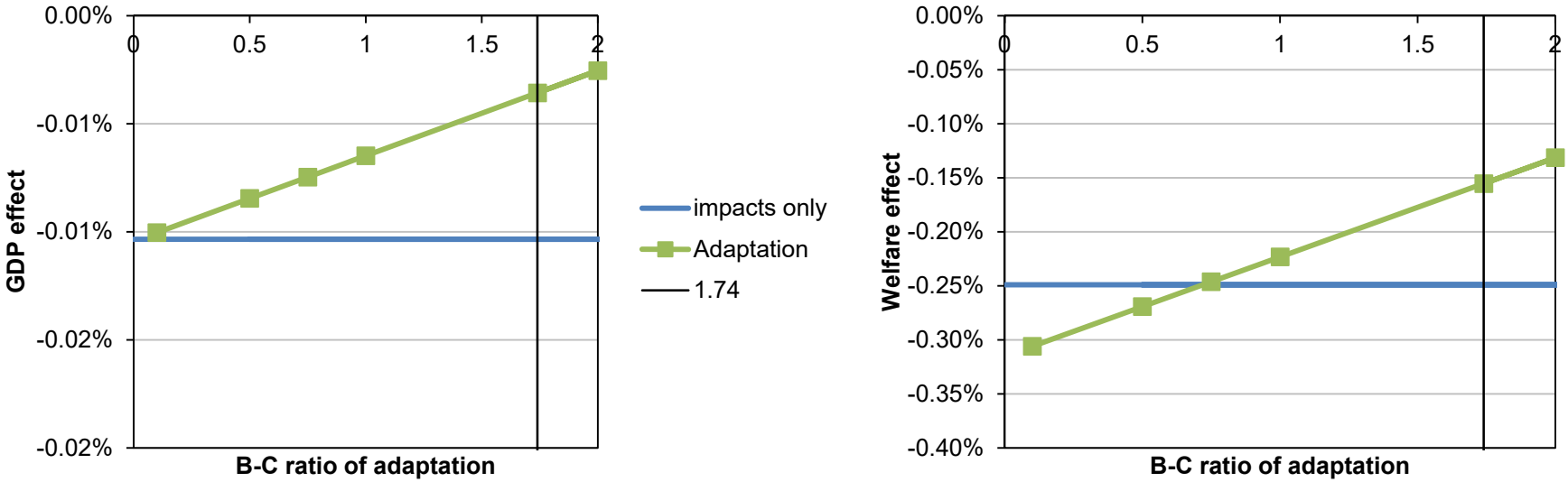
Catastrophe Management

Effectiveness of adaptation: Minimum B-C ratio for net gain

- GDP: positive GDP effect for very low B-C ratio (10%)
- Welfare: positive welfare effect for B-C ratio below 1 (75%)



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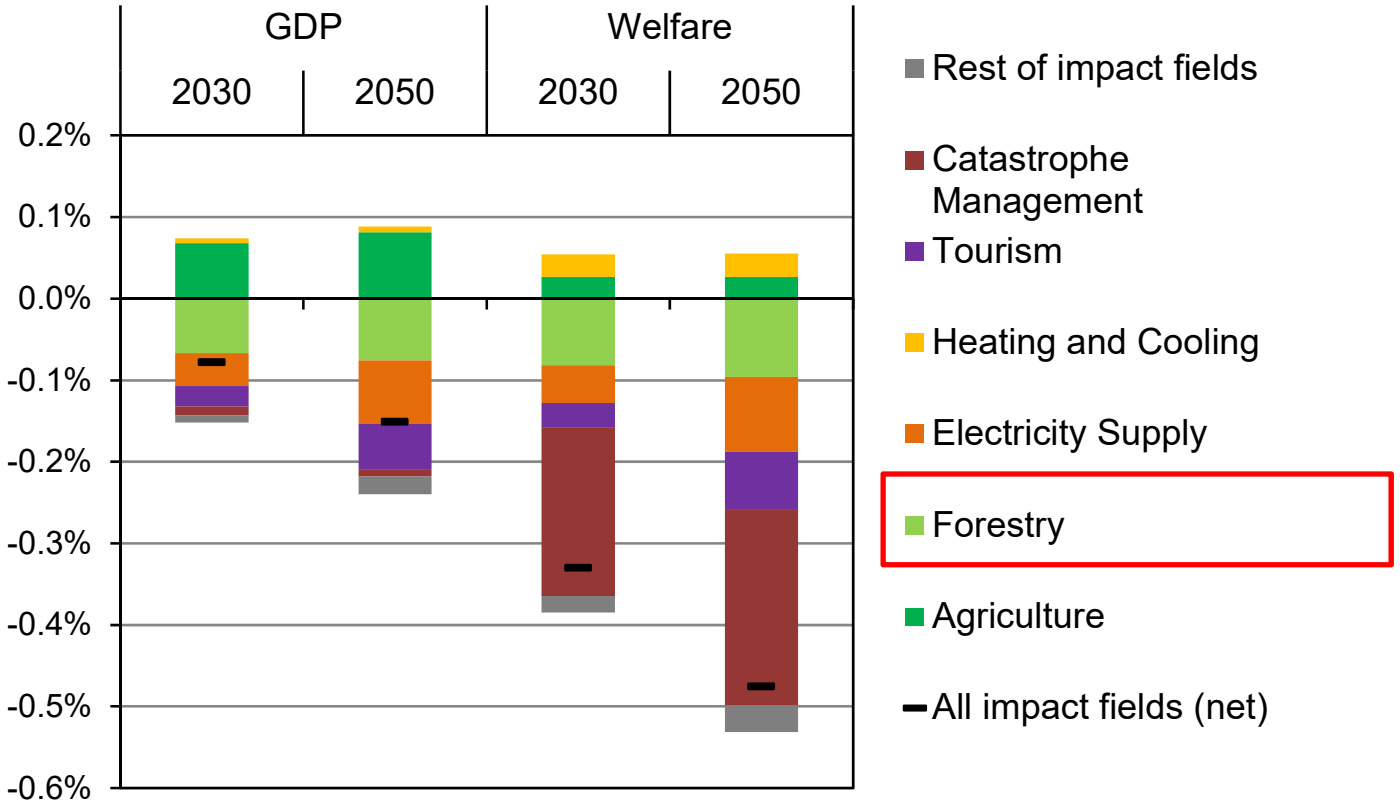
Forestry



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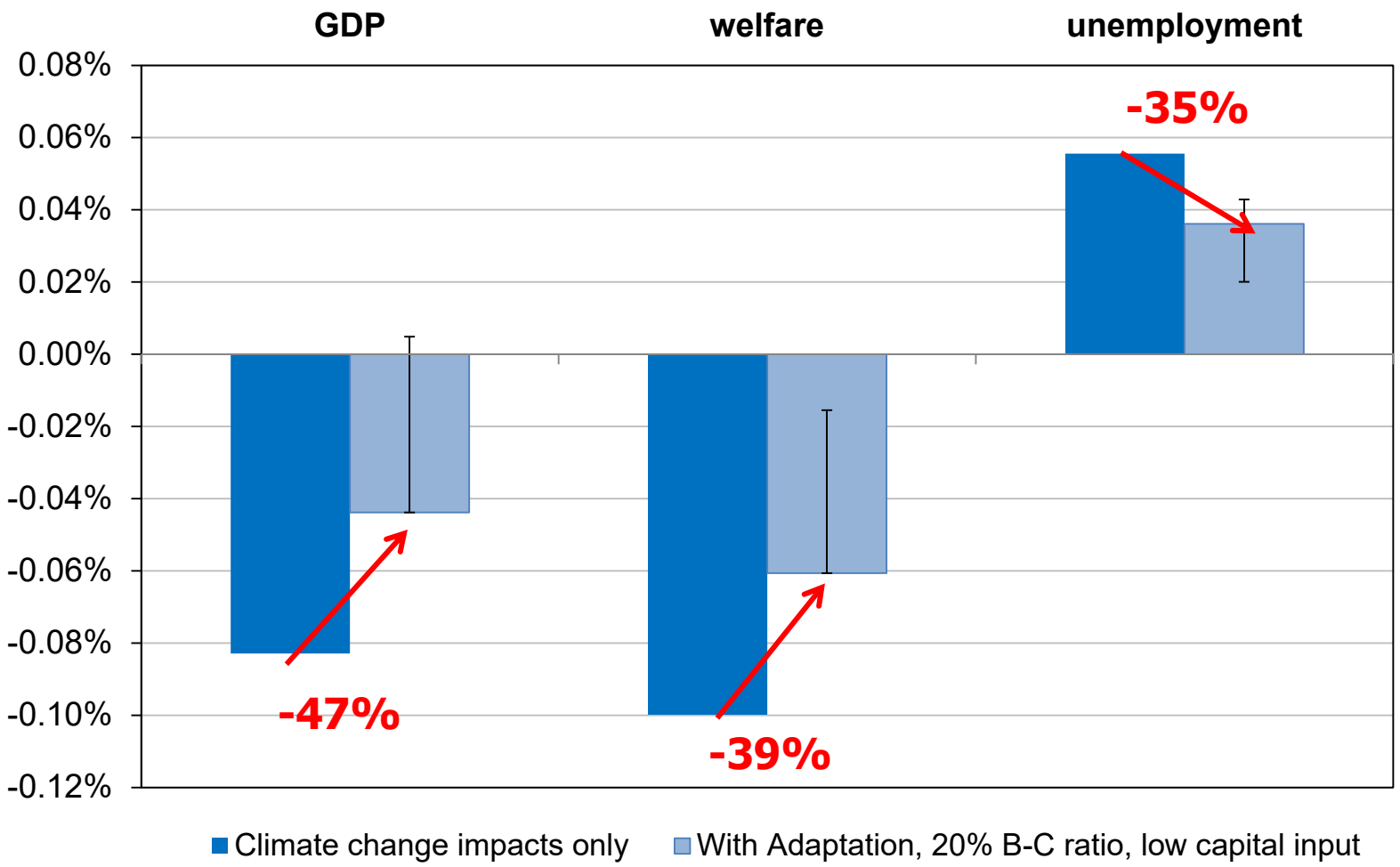
Forestry



Note: Error bars stand for different assumptions on effectiveness and costs (20% to 50% B-C ratio, higher K intensity: +0.05% to +2%)

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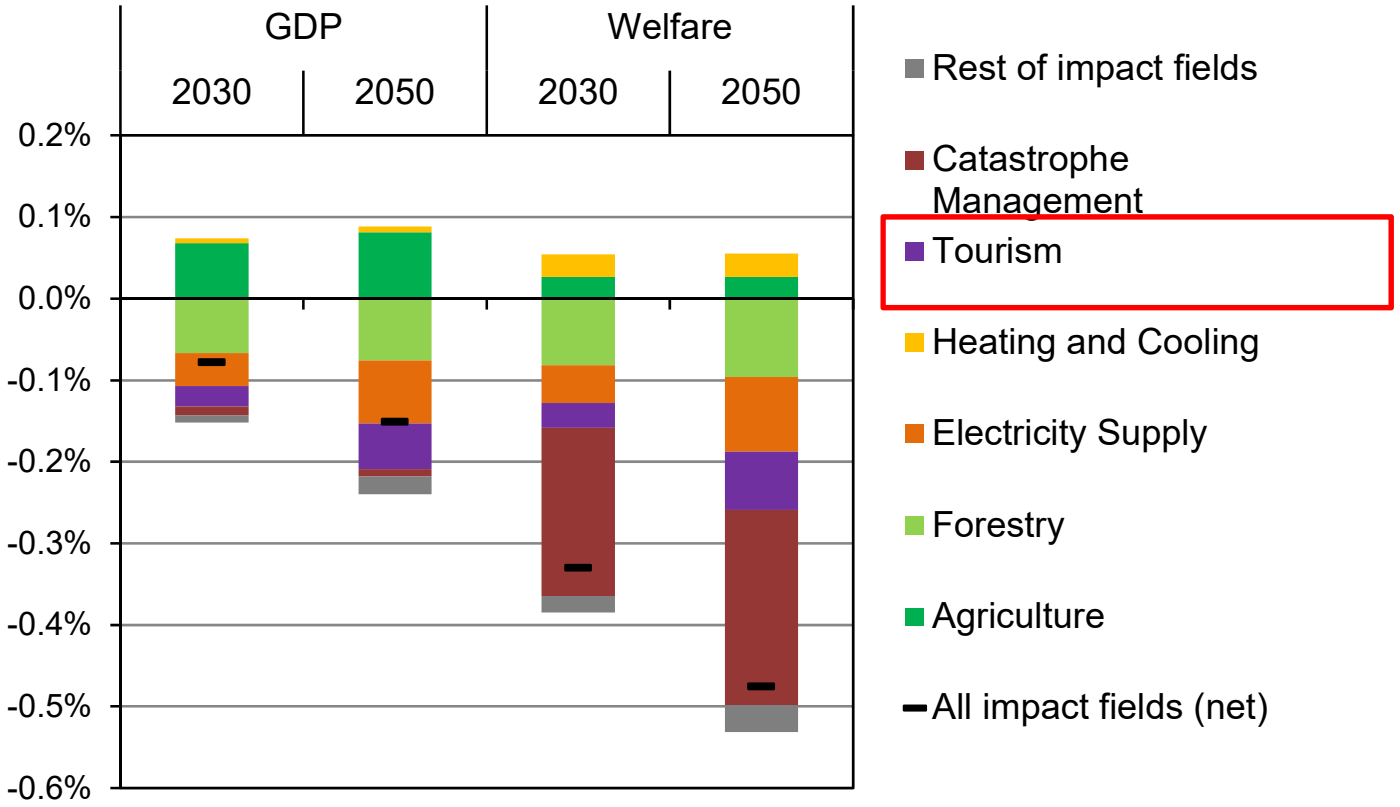
Tourism



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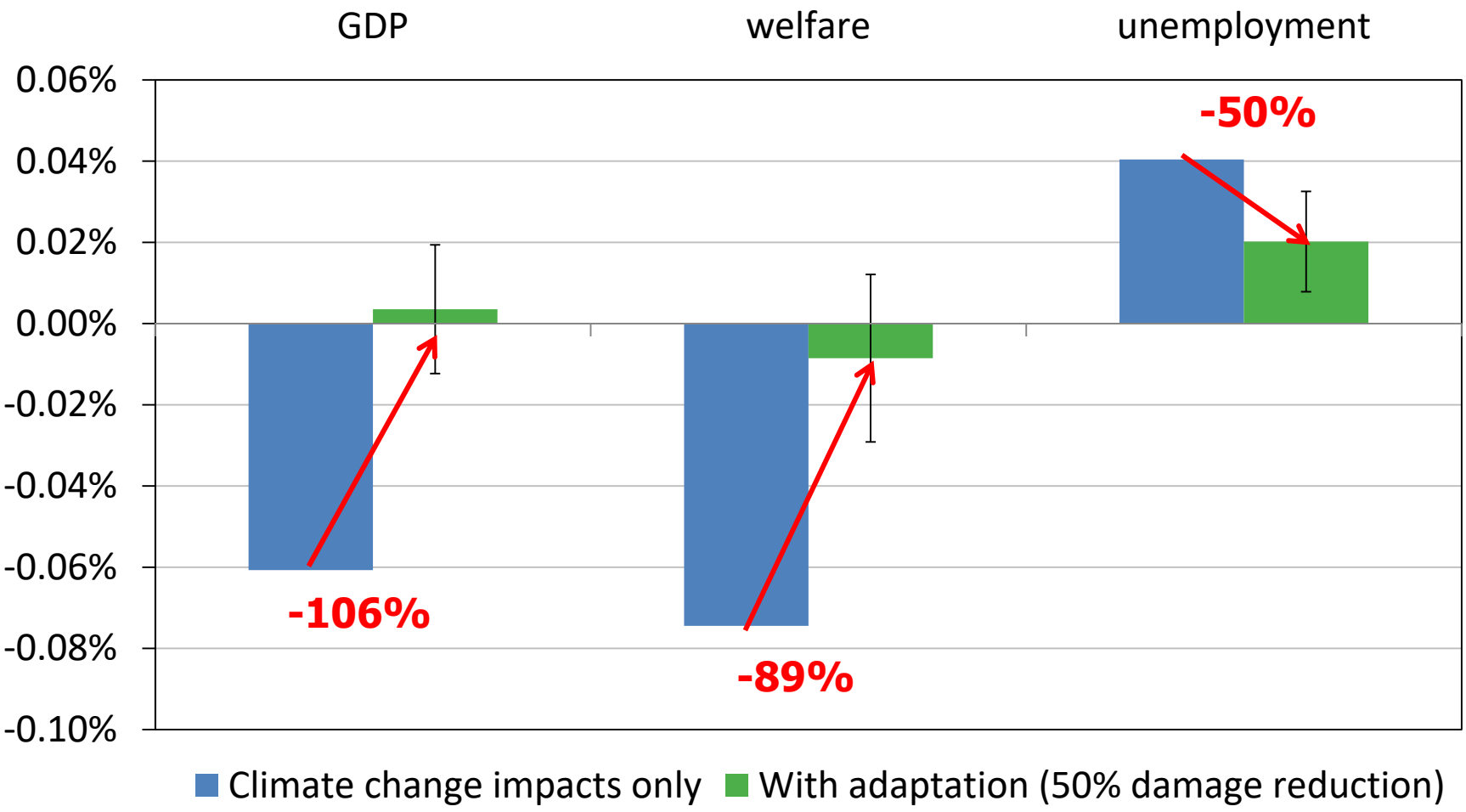
Tourism



Note: Error bars stand for different assumptions on effectiveness (Benefit cost ratio 25% to 75%)

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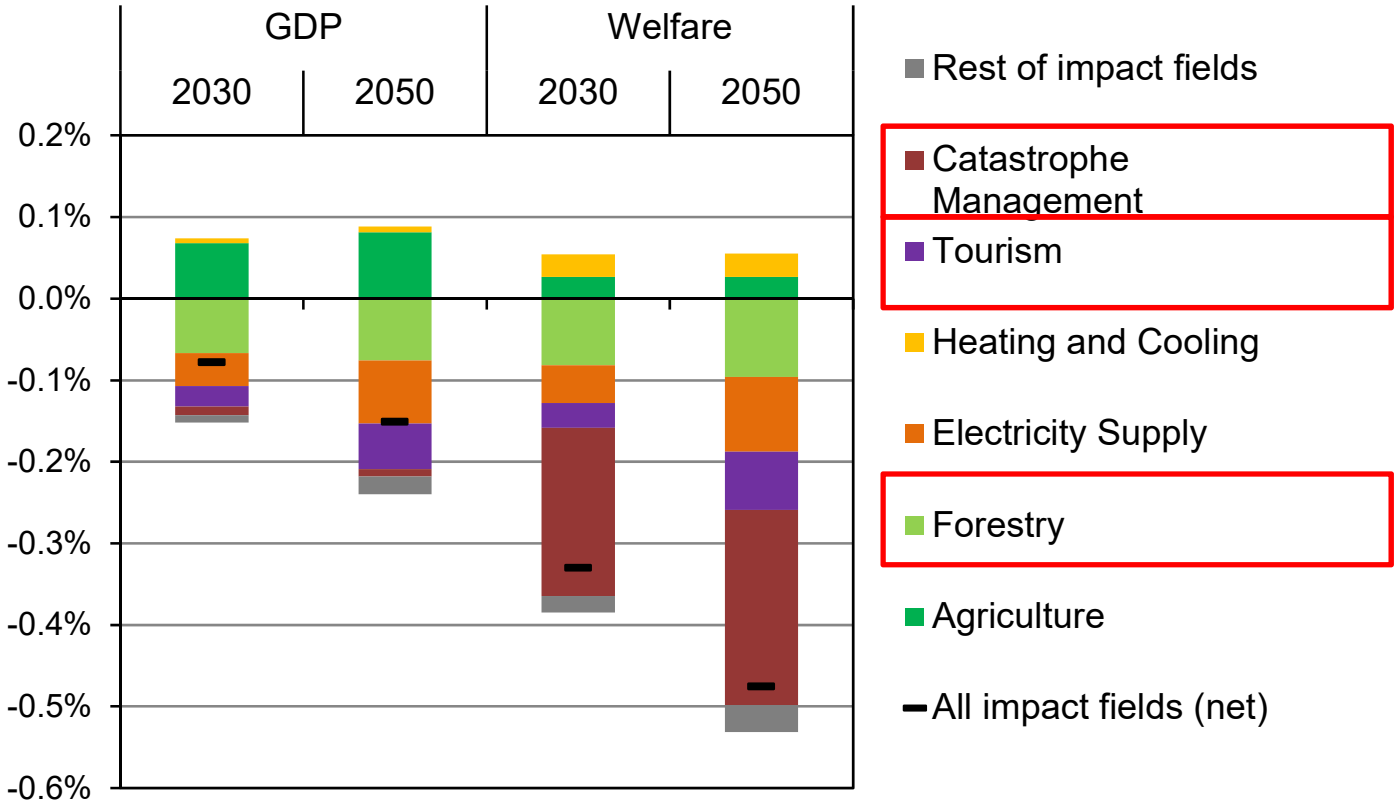
Adaptation measures combined



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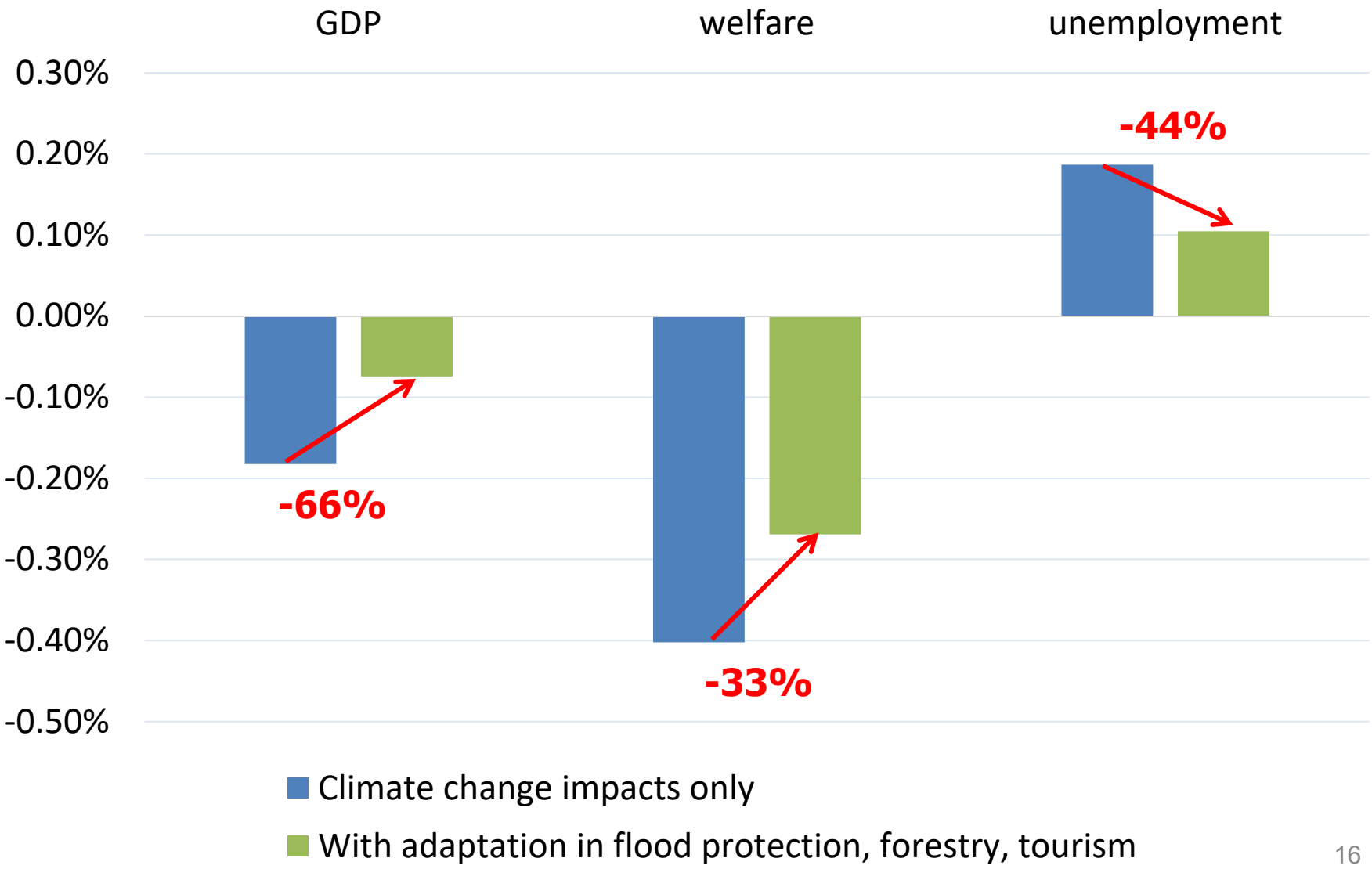
Adaptation measures combined



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Effects on public budgets

- **Direct expenditure effects of CC impacts:**
  higher public expenditures on
  - Disaster relief payments
  - Reconstruction of public infrastructure (incl. protective forests)
- **Direct expenditure effects of CC adaptation:**
  higher public expenditures on
  - Investment in flood protection (dikes)
  - R&D investment for development of new forest tree species
- **Indirect effects on government expenditures and revenues:**
  - Lower tax base
  - Unemployment benefits
- **Public austerity and budgetary rules:**
  - Balanced budget
  - (Increase deficit)
  - (Foreign lending)

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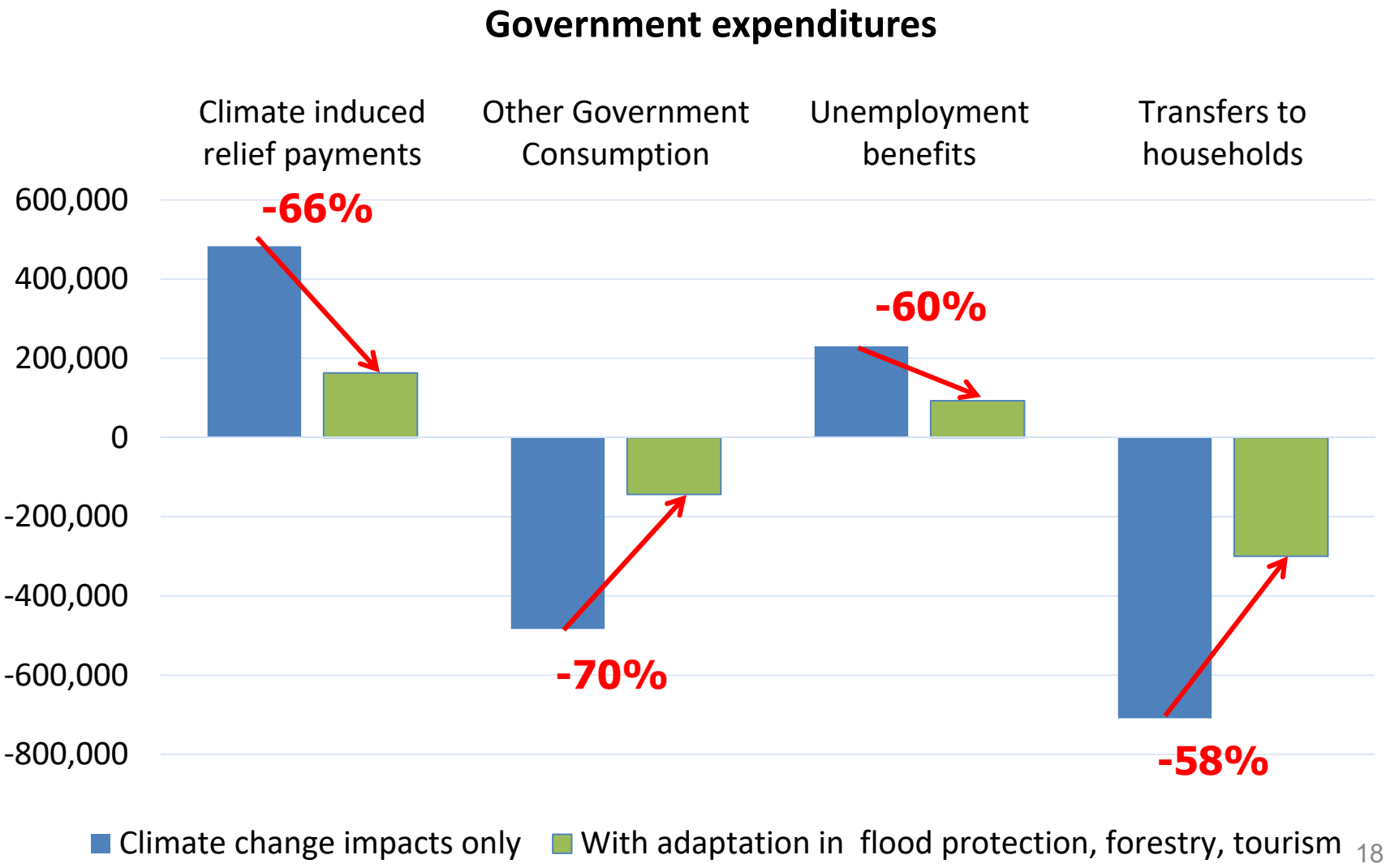
Adaptation measures combined



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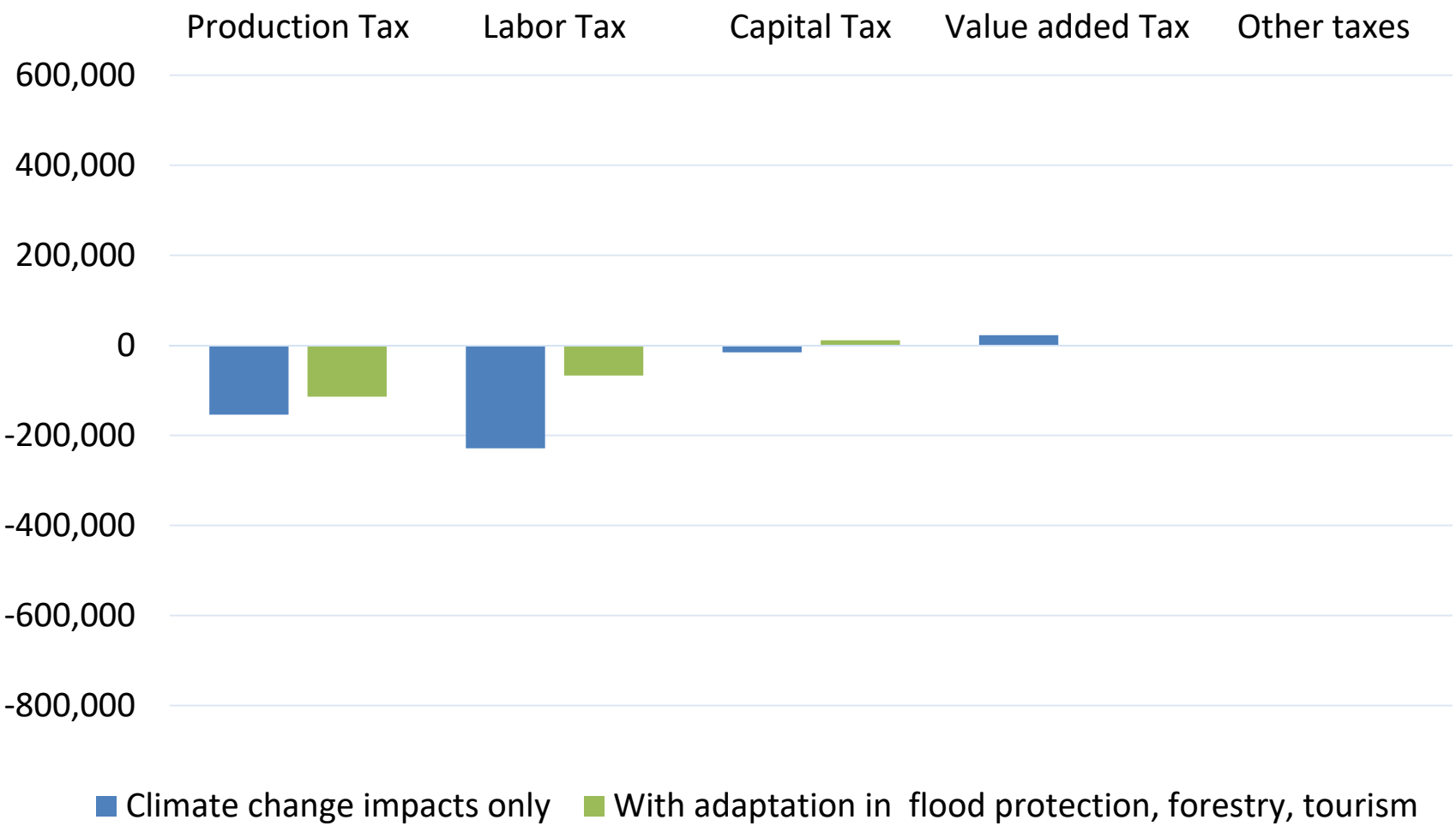
Adaptation measures combined

Government revenues



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Conclusions

- **Adaptation in 3 most important impact fields** can reduce
  - 2/3 of relief payments and GDP costs
  - 1/3 of welfare costs
  - almost 1/2 of unemployment
- **Public adaptation spending on flood protection, forestry, tourism is highly effective**
  - government balance improves, because of lower expenditures on disaster relief and unemployment benefits
  - more room for other government consumption (education, health etc.) which contributes positively to GDP and welfare
- But: results depend on reliability of benefit and cost estimates of adaptation – more research needed

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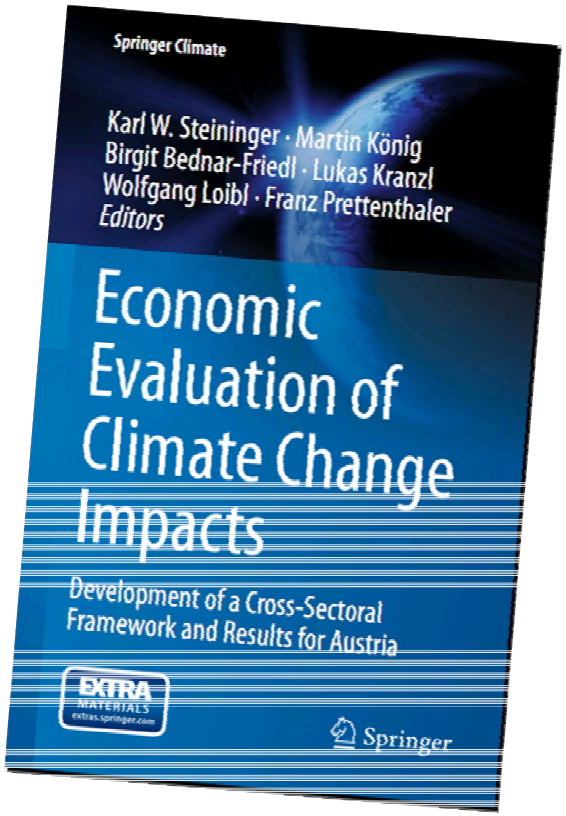
- **PACINAS website:**
  http://anpassung.ccca.at/pacinas/

- **The Cost of Inaction (COIN) Project**

  Steininger, K., König, M., Bednar-Friedl, B., Kranzl, L., Loibl, W., Prettenthaler, F. (ed.), (2015), *Economic Evaluation of Climate Change Impacts: Development of a Cross-Sectoral Framework and Results for Austria*. Springer, Berlin.

  http://coin.ccca.at



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