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Net-Zero Target and Public Finances: A Projection Framework for Switzerland

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Introduction

- Switzerland is legally committed to reach **carbon neutrality by 2050** (net zero emissions)
- We project the **long-term impact of climate mitigation policies** to achieve the net-zero emissions target on **public finances** in Switzerland
- Focus on:
  - **Revenues, expenditure, budget balance and public debt** until 2060
  - **All levels of government**, including social security funds
  - Different **climate policy mixes**, including carbon pricing, regulation and subsidies
- The costs of **climate change and climate adaptation** measures could **not** be **included** in the analysis due to uncertainties and lack of data and modelling tools

Preview of findings

- The path to net-zero emissions will increase **fiscal pressure**
- Public budgets are mainly affected on the **revenue side**, both through **direct and indirect effects** (slower economic growth)
- The **federal government** and **social security funds** will be hit hardest
- The introduction of **replacement levies** on electric vehicles is crucial to compensate for revenue losses from fuel taxes
- The use of **green subsidies** would increase fiscal pressure further

Climate policies in Switzerland

- **Carbon pricing:**
  - CO2 tax on thermal fossil fuels (heating oil and natural gas) (CHF 120t/CO2)
  - CH-ETS for large emitters in industry, energy and aviation (link to EU-ETS)
  - Mineral oil tax on crude oil and motor fossil fuels (fuel excise tax)
- **Subsidies:**
  - Investment contributions on renewable energy (PV, biomass, wind, …)
  - Public buildings program (energy-efficient renovation)
  - Technology funds to promote innovations (renewables, energy efficiency, …)
- **Regulation (emissions standards):**
  - Vehicles (import of fleet targets with maximum level of CO2 emissions)
  - Buildings energy codes (standards for new and existing buildings for CO2 emissions)

Methodological approach

- Projection of public finances of **all levels of government** between **2021-2060**
- We develop a **budget-impact model** that builds on the results of the **Energy Perspectives 2050+** (DETEC, 2022), which analyzed the impacts of the energy transition on:
  - Energy system (energy system models)
  - Macroeconomic aggregates (CGE)
- **Data** from empirical literature and several federal offices (FFA, SECO, SFOE, FOEN, FSO, …)
- Fiscal rules assumed to be non-binding (e.g. federal debt brake)
- **Reference scenario** (business-as-usual) vs. **policy scenarios** in which the net-zero target is achieved by 2050 (carbon pricing, emissions standards, subsidies)
  - Interim targets (2030 and 2040), 2050 net-zero target, and sectoral emissions targets
  - Differences in outcomes across scenarios are the key variables of analysis

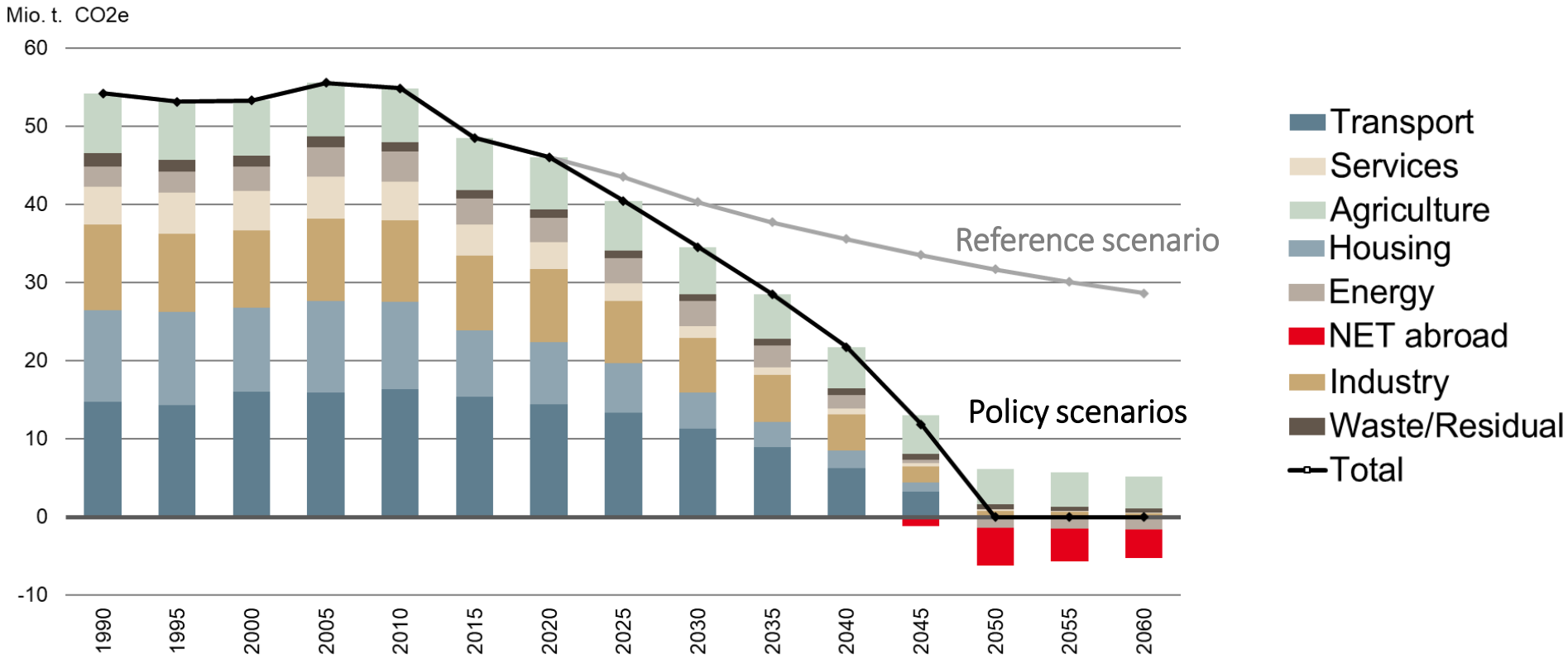
Overview of scenarios

		Policy scenarios for achieving the net zero target by 2050			
Source of emissions	**Reference scenario** (BAU)	**Policy scenario 1**	**Policy scenario 2**	**Policy scenario 3**	**Policy scenario 4**
Energy-intensive industries	**Emissions trading system** (linked to EU-ETS)				
Thermal fossil fuels (e.g. heating oil, natural gas)	CO_2 levy (CHF 96/t CO_2)	**CO_2 levy** (CHF 96/t to max. CHF 500/t CO_2)		a) **Emissions standards** b) CO_2 levy (CHF 120 /t CO_2)	a) Emissions standards b) CO_2 levy (CHF 120 /t CO_2) c) **CIA federal subsidies**
Motor fossil fuels (e.g. petrol, diesel)	No regulation	Emissions standards	**CO_2 levy** (CHF 0 to max CHF 400/t CO_2)	Emissions standards	
Electricity production	No regulation	Exogenously determined minimum quotas for production from renewable energies			
Other (mainly agriculture, waste and industrial processes)	No regulation	Utilisation of carbon capture and storage (**CCS**) and negative emission technologies (**NET**).Financed by polluters			Utilisation of CCS and NET. NET financed by **federal subsidies**
Replacement levies	**Replacement levies** to compensate for mineral oil tax (incl. surcharge), LSVA (from 2030) and motor vehicle taxes (from 2028)				

Notes: In the reference scenario, based on the Energy Perspectives 2050+, all of the energy and climate policy measures and instruments that were in force by the end of 2018 are continued. The level of the CO2 levy on fuels is below the value of CHF 120 per tonne of CO2 introduced from 2022.

Emissions reduction path to net zero

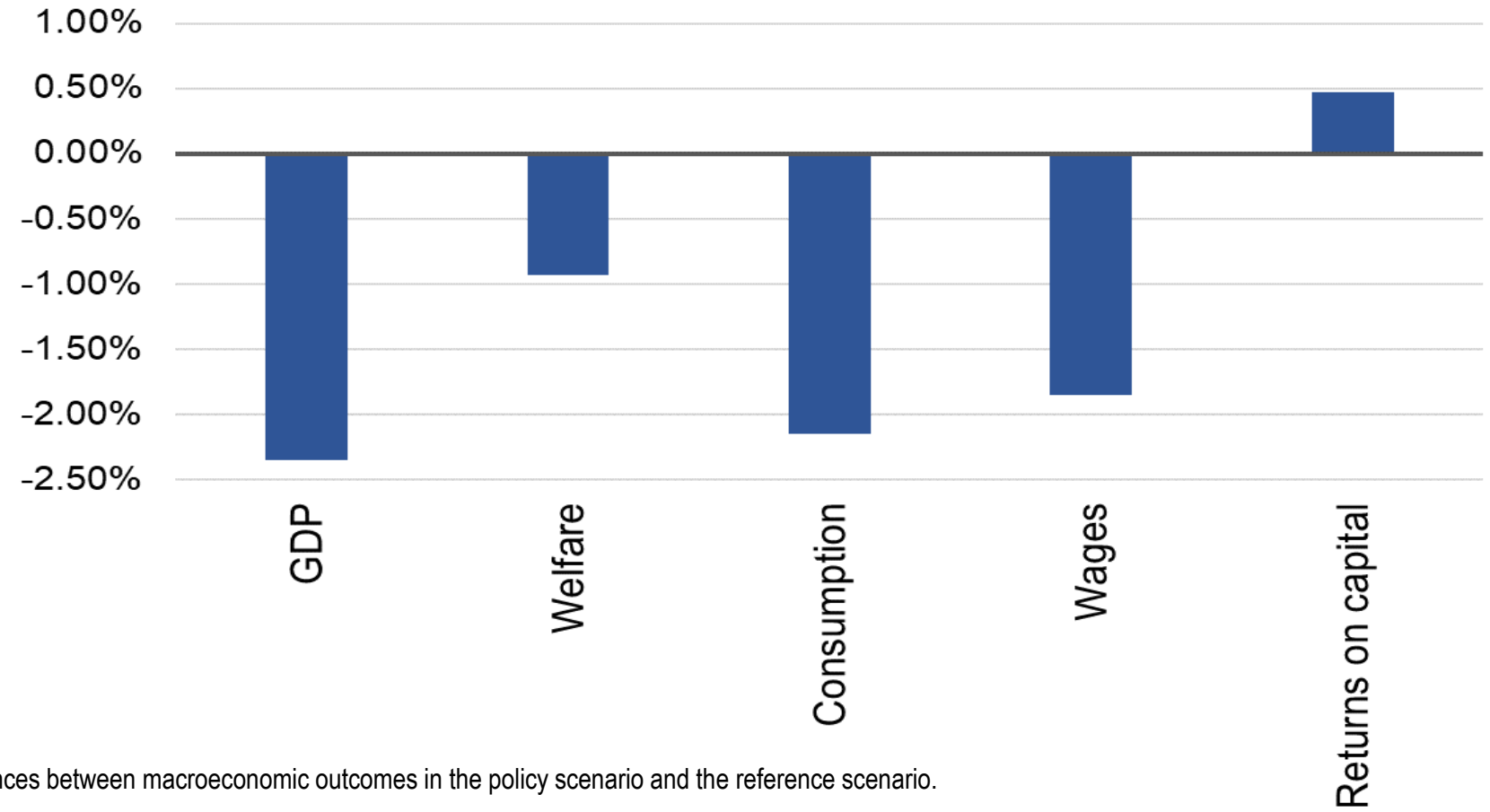
CO2 emissions reduction by sector in the reference scenario and in the policy scenarios (in million tons of CO2-equivalent)



Notes: Emissions reduction paths are taken from the energy system models of the Energy Perspectives 2050+. These scenarios are grounded in a realistic and efficient trajectory for reducing emissions within the Swiss economy, incorporating intermediate emissions reduction targets, as mandated by Swiss law. NET= Negative emissions technologies.

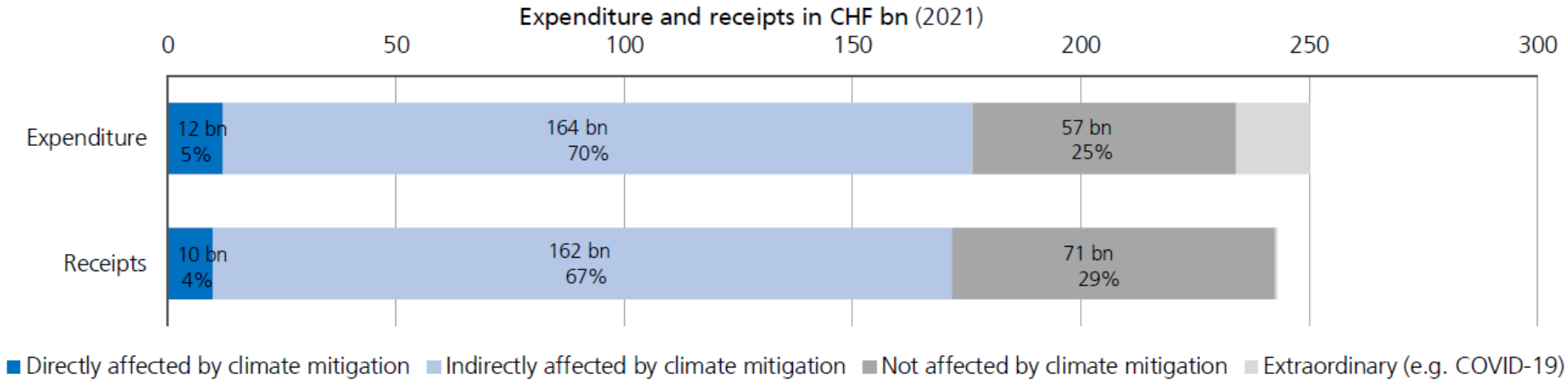
Climate mitigation slows economic growth

Impact of climate mitigation measures in policy scenario 1 on macroeconomic aggregates compared to the reference scenario (2060, level effects in %)



Notes: Differences between macroeconomic outcomes in the policy scenario and the reference scenario.

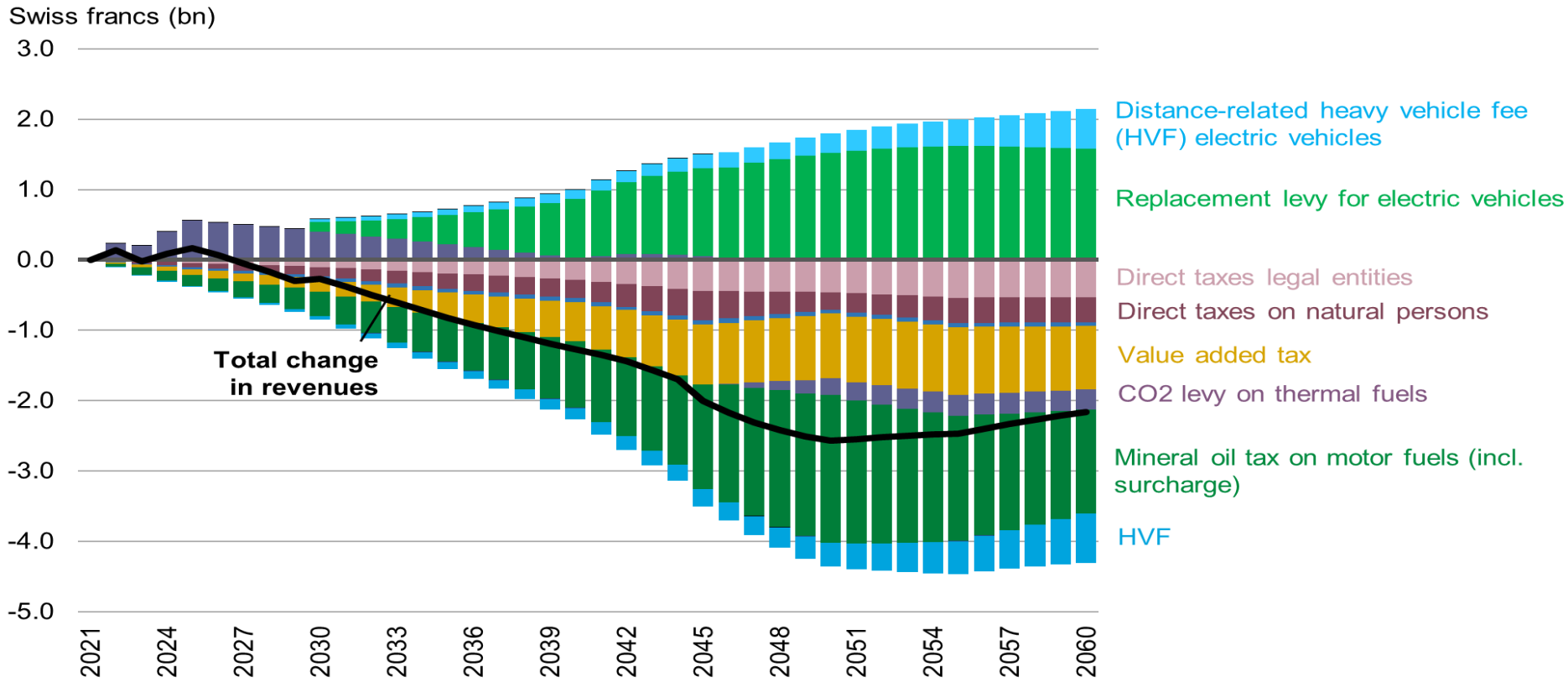
Revenues and expenditure affected by climate mitigation measures in 2021



- **Direct:** e.g. mineral oil tax, CO2 levy on thermal fuels and public expenditure in buildings program of Confederation and Cantons
- **Indirectly affected by slower economic growth (GDP, consumption, wages):** e.g. direct taxes, VAT and personnel expenditure

Climate mitigation decreases revenue growth

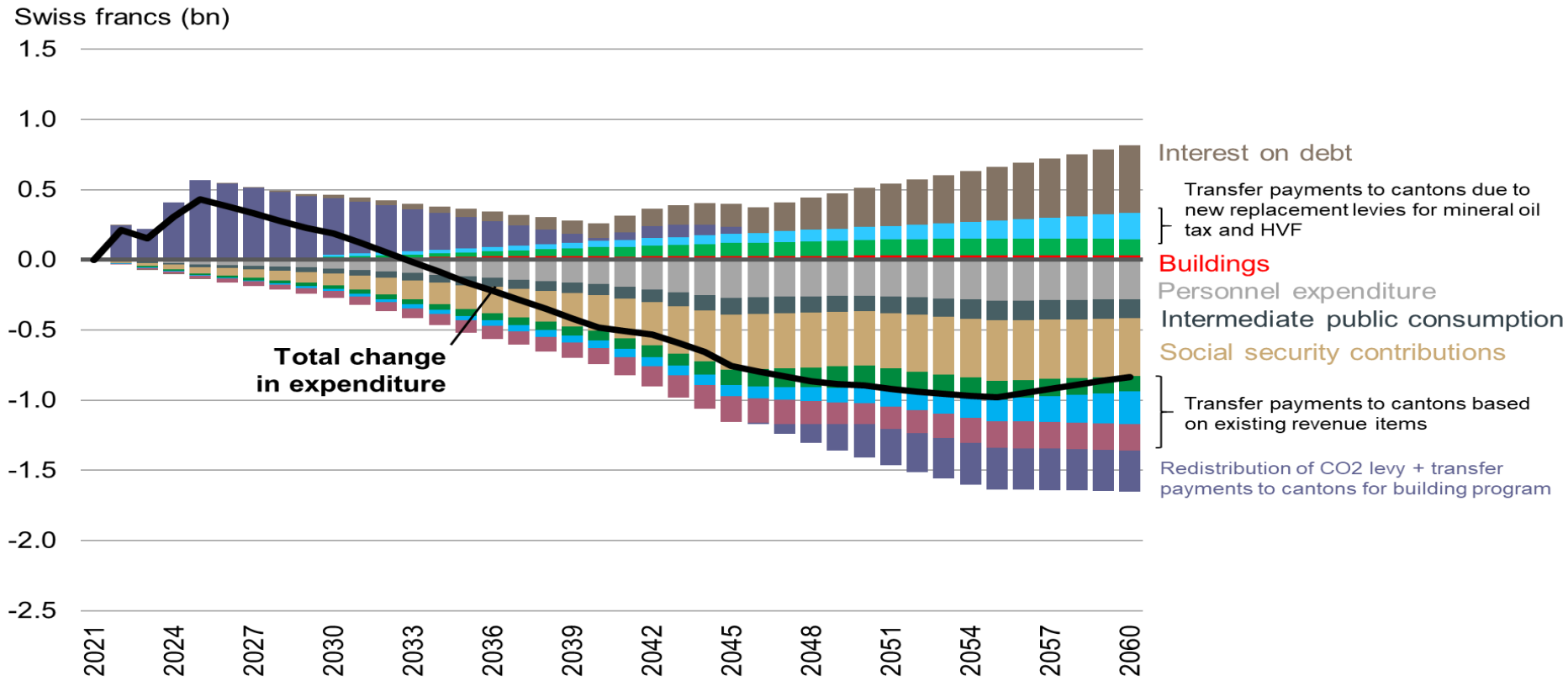
Impact of climate mitigation measures in policy scenario 1 on federal revenues compared to the reference scenario (in CHF bn at 2021 prices)



Notes: Differences between revenue in the policy scenario and the reference scenario in billions of francs at 2021 prices. In 2060, revenues in the policy scenario are about CHF 2.2 billion lower than in the reference scenario, i.e. **1.7% of total ordinary revenues** of the federal government in 2060.

Climate mitigation decreases expenditure growth

Impact of climate mitigation measures in policy scenario 1 on federal expenditure compared to the reference scenario (in CHF bn at 2021 prices)



Notes: Differences between expenditure in the policy scenario and the reference scenario in billions of francs at 2021 prices. Transfers to cantons include the cantonal shares of mineral oil tax, the HVF and direct federal tax. In 2060, expenditures in the policy scenario are about CHF 0.9 billion lower than in the reference scenario, i.e. **0.7% of total ordinary expenditure** of the federal government in 2060.

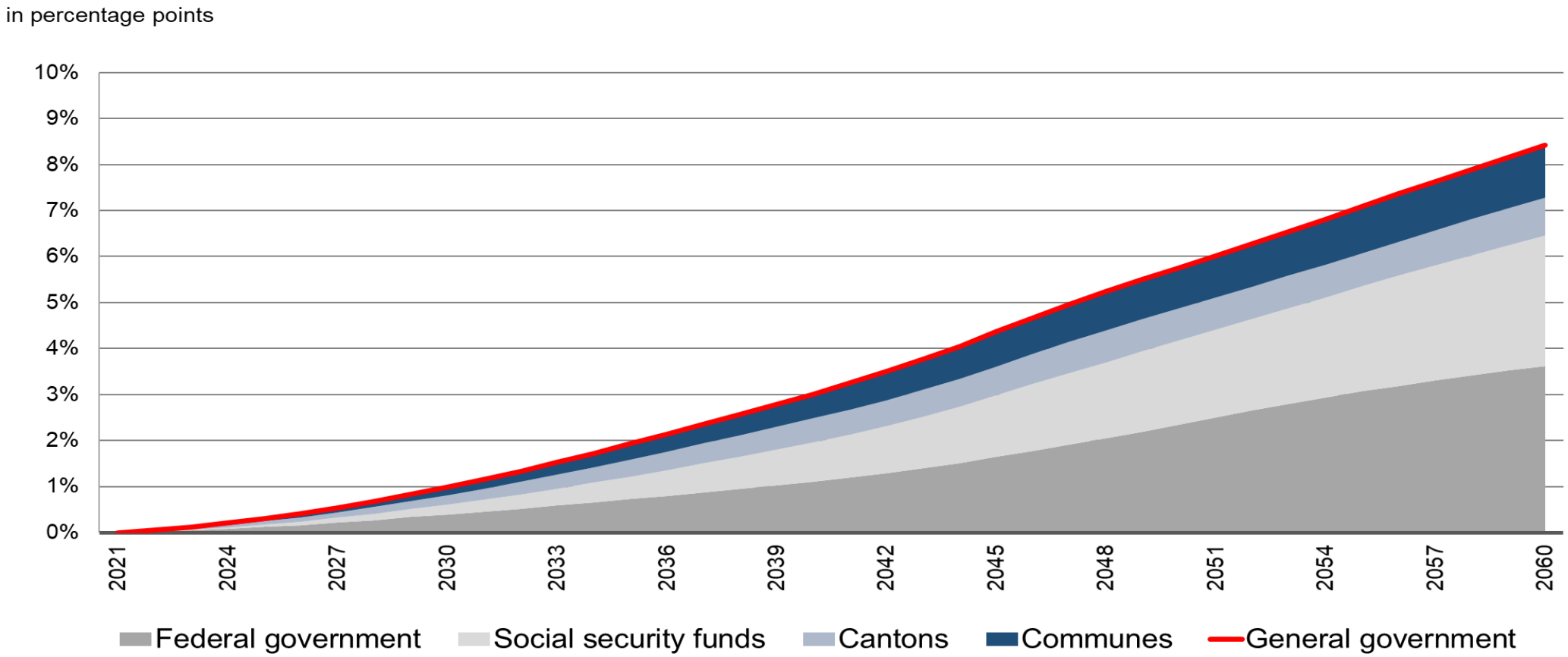
More pressure on public budget balances

Impact of climate mitigation measures on the budget balance by level of government in policy scenario 1 compared to the reference scenario (in CHF bn at 2021 prices)

Government level	2030	2040	2050	2060
Confederation	-0.4	-0.7	-1.7	-1.3
in % of Confederation total receipts, reference scenario	0.5%	0.7%	1.5%	1.0%
Cantons	-0.3	-0.4	-0.1	-0.4
in % of cantons total receipts, reference scenario	0.3%	0.3%	0.1%	0.2%
Communes	-0.2	-0.3	-0.1	-0.2
in % of communes total receipts, reference scenario	0.3%	0.4%	0.1%	0.3%
Social security funds	-0.4	-0.8	-0.9	-1.4
in % of social security funds total receipts, reference scenario	0.5%	0.9%	0.9%	1.2%
General government	-1.3	-2.1	-2.8	-3.4
in % of general government total receipts, reference scenario	0.5%	0.7%	0.8%	0.8%
in % GDP, reference scenario	0.2%	0.2%	0.3%	0.3%

Climate mitigation will increase public debt

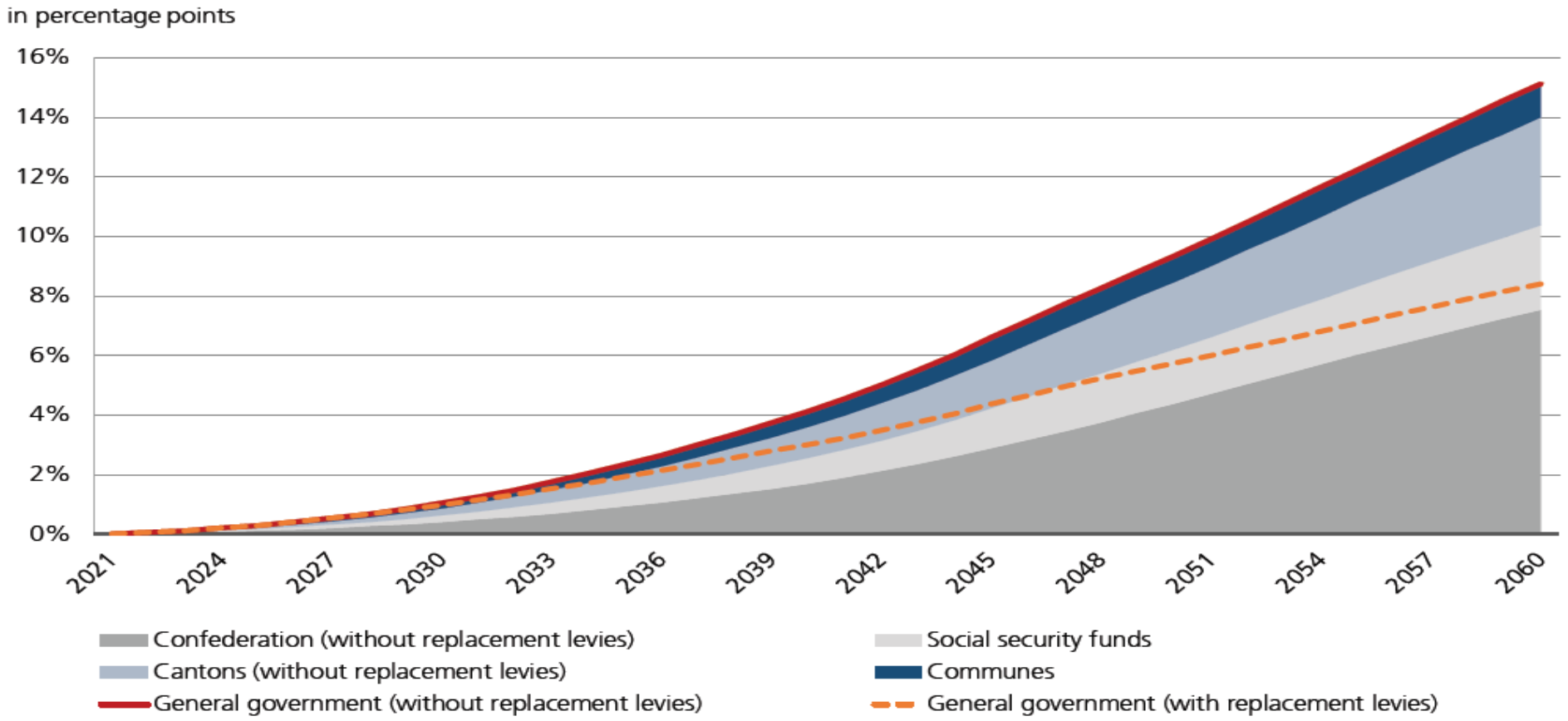
Impact of climate mitigation measures in policy scenario 1 on the public debt ratio by level of government compared to the reference scenario (in percentage points)



Notes: Public debt ratios in the policy scenario and the reference scenario are expressed as a percentage of GDP.

Public debt without replacement levies

Impact of climate mitigation measures in policy scenario 1 on the public debt ratio by level of government compared to the reference scenario (in percentage points)



Notes: Public debt ratios in the policy scenario and the reference scenario are expressed as a percentage of GDP.

Subsidies will increase fiscal pressure further

Impact of climate mitigation measures on the debt ratio in policy scenarios 1 to 4 compared to the reference scenario (in percentage points)

	Policy scenario 1				Policy scenario 2 (CO_2 levy)			
Government level	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Confederation	0.4%	1.1%	2.3%	3.6%	0.4%	1.1%	2.4%	3.7%
Cantons	0.2%	0.5%	0.7%	0.8%	0.2%	0.6%	0.8%	1.2%
Communes	0.2%	0.5%	0.9%	1.1%	0.2%	0.5%	1.0%	1.3%
Social security funds	0.2%	0.9%	1.8%	2.8%	0.2%	0.8%	1.9%	3.2%
General government	1.0%	3.0%	5.8%	8.4%	1.0%	2.9%	6.1%	9.4%
	Policy scenario 3 (regulation)				**Policy scenario 4** (subsidies)			
Government level	**2030**	**2040**	**2050**	**2060**	**2030**	**2040**	**2050**	**2060**
Confederation	0.4%	1.2%	2.5%	3.8%	0.7%	1.6%	3.5%	5.8%
Cantons	0.2%	0.5%	0.7%	0.9%	0.2%	0.5%	0.7%	0.9%
Communes	0.2%	0.6%	0.9%	1.2%	0.2%	0.6%	0.9%	1.2%
Social security funds	0.2%	1.0%	2.2%	3.3%	0.3%	1.1%	2.2%	3.2%
General government	1.0%	3.3%	6.4%	9.2%	1.3%	3.8%	7.4%	11.0%

Conclusions

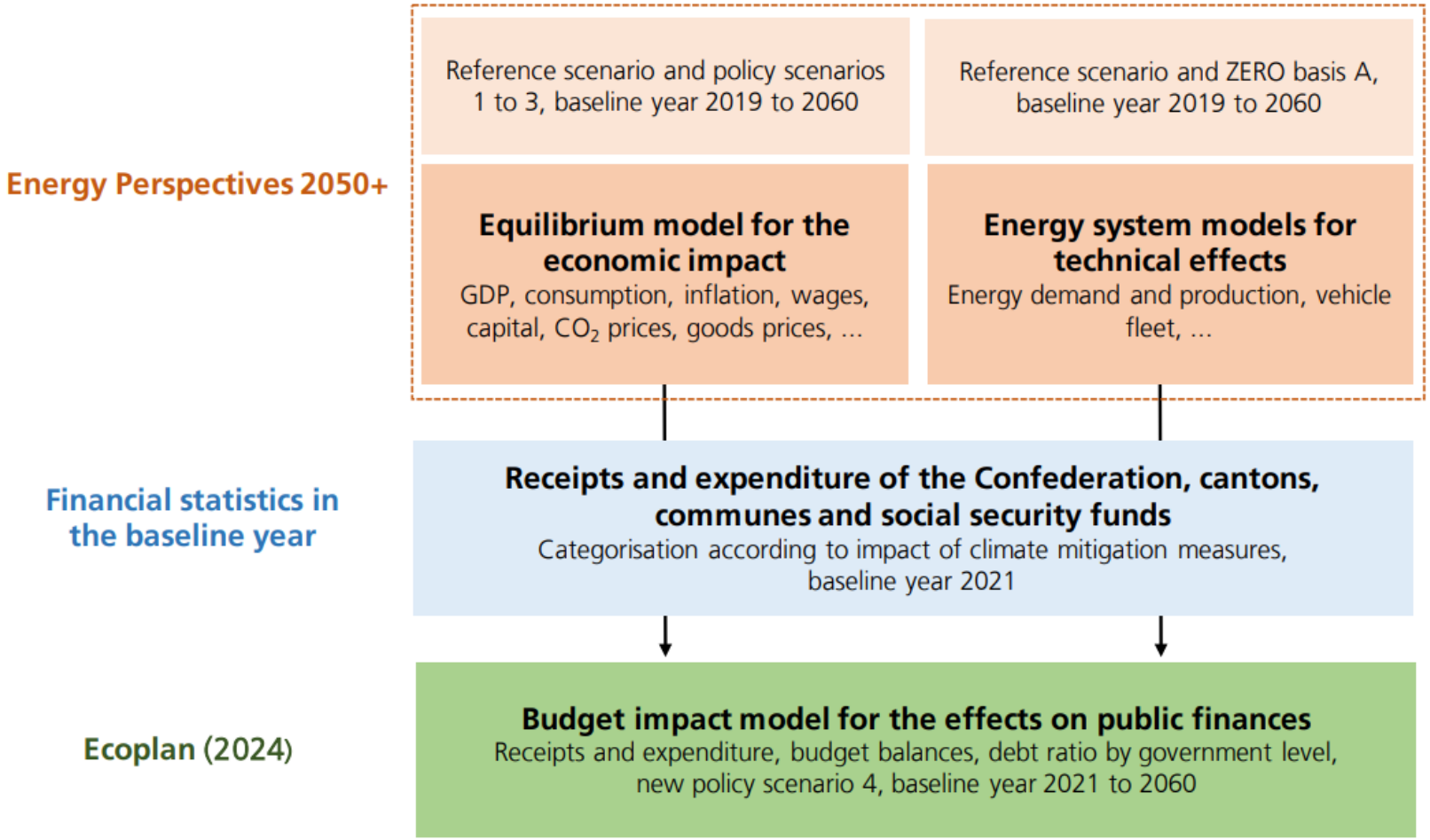
Take-aways

- We project the **long-term impact of climate mitigation policies** to achieve net-zero emissions **on public finances in Switzerland**
- According to our projections, the path to net zero will increase **fiscal pressure**
  - Public budgets are mainly affected on the **revenue side**, both through **direct and indirect effects** (slower economic growth)
  - The **federal government** and **social security funds** will be hit hardest
  - The introduction of **replacement levies** is crucial to compensate for revenue losses from fuel taxes while the use of **subsidies** would increase fiscal pressure further
- We focus on the costs of climate policy. **Further research** is needed to evaluate the **fiscal costs of climate change** itself in order to assess the benefits of climate policy as well

Appendix

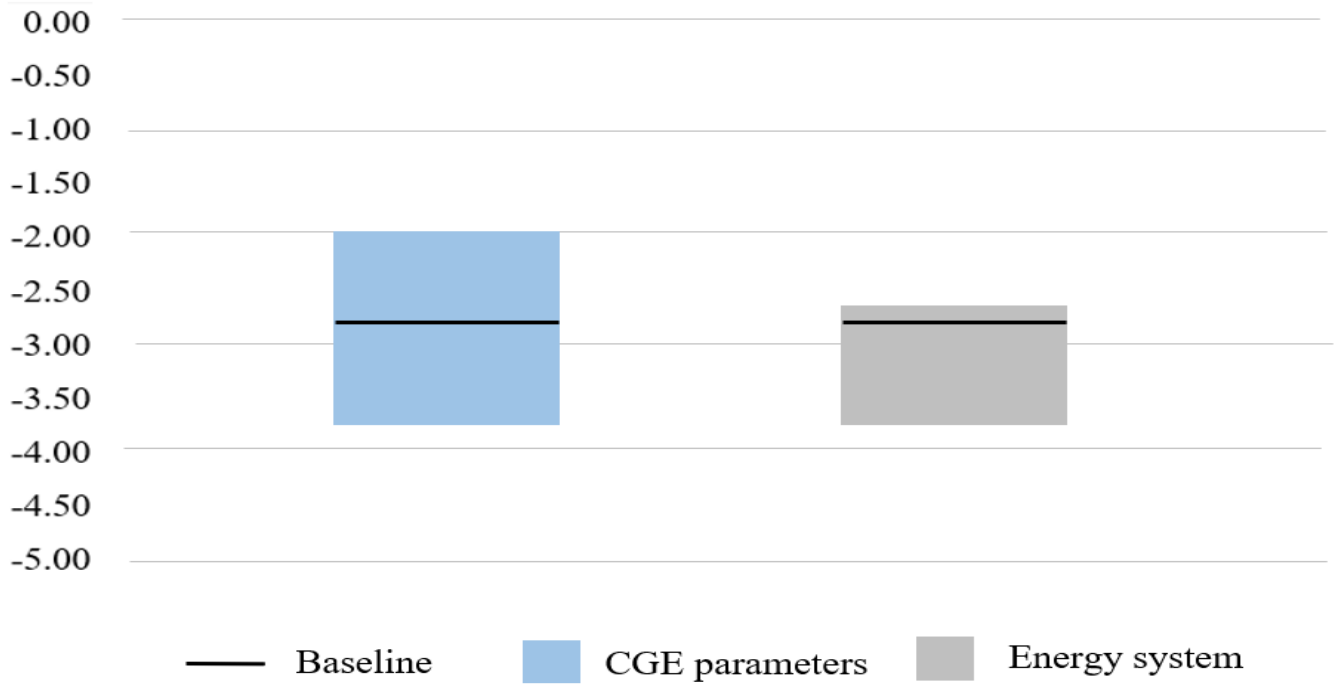
Model overview

Energy system models, CGE and budget-impact model



Sensitivity analysis

The impact of climate mitigation measures on the budget balance of the general government in policy scenario 1 compared to the reference scenario (in CHF bn at 2021 prices)



Notes: The sensitivity analysis includes alternative assumptions on capital mobility, labor market flexibility, capital, labor, energy and material (KLEM) elasticities, substitution possibilities in the transportation and energy sectors, and trade elasticities to price changes. Each parameter is substituted with a higher or lower value than in the baseline CGE specification. Moreover, a sensitivity analysis was conducted on assumptions related to the energy system using higher and lower values of selected parameters than in the baseline, including electricity production, as well as costs and potentials of NET and synthetic fuels (synfuels).

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