OG-ZAF: Previous and New Simulations

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Previous Simulations

Simulations we did in August 2024 and before:

- Corporate tax rate cut
- Energy tax
- Education reform

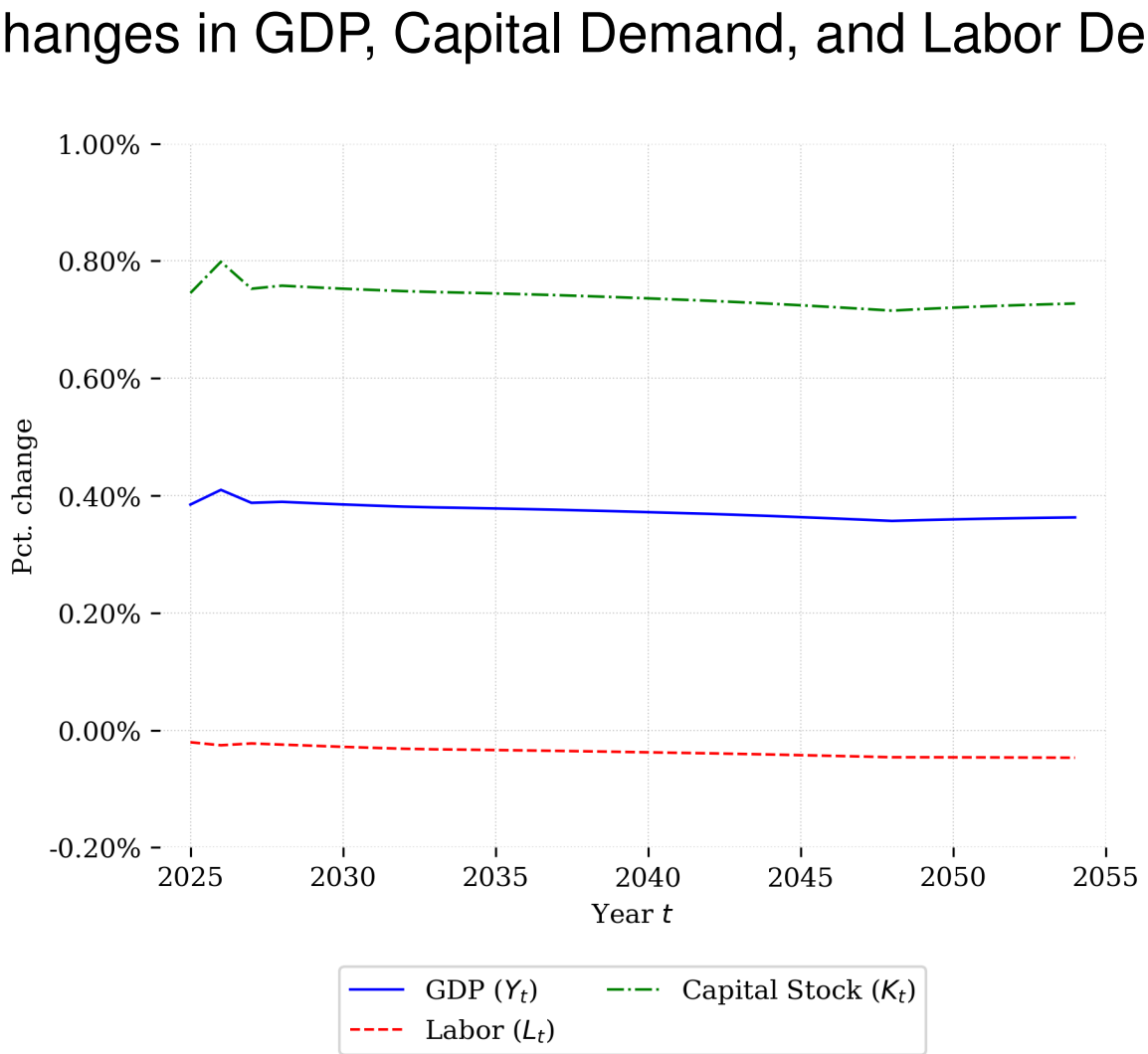
CIT Rate Cut: Scenario

- Hypothetical: Permanent decrease in the CIT rate from 27% to 25%

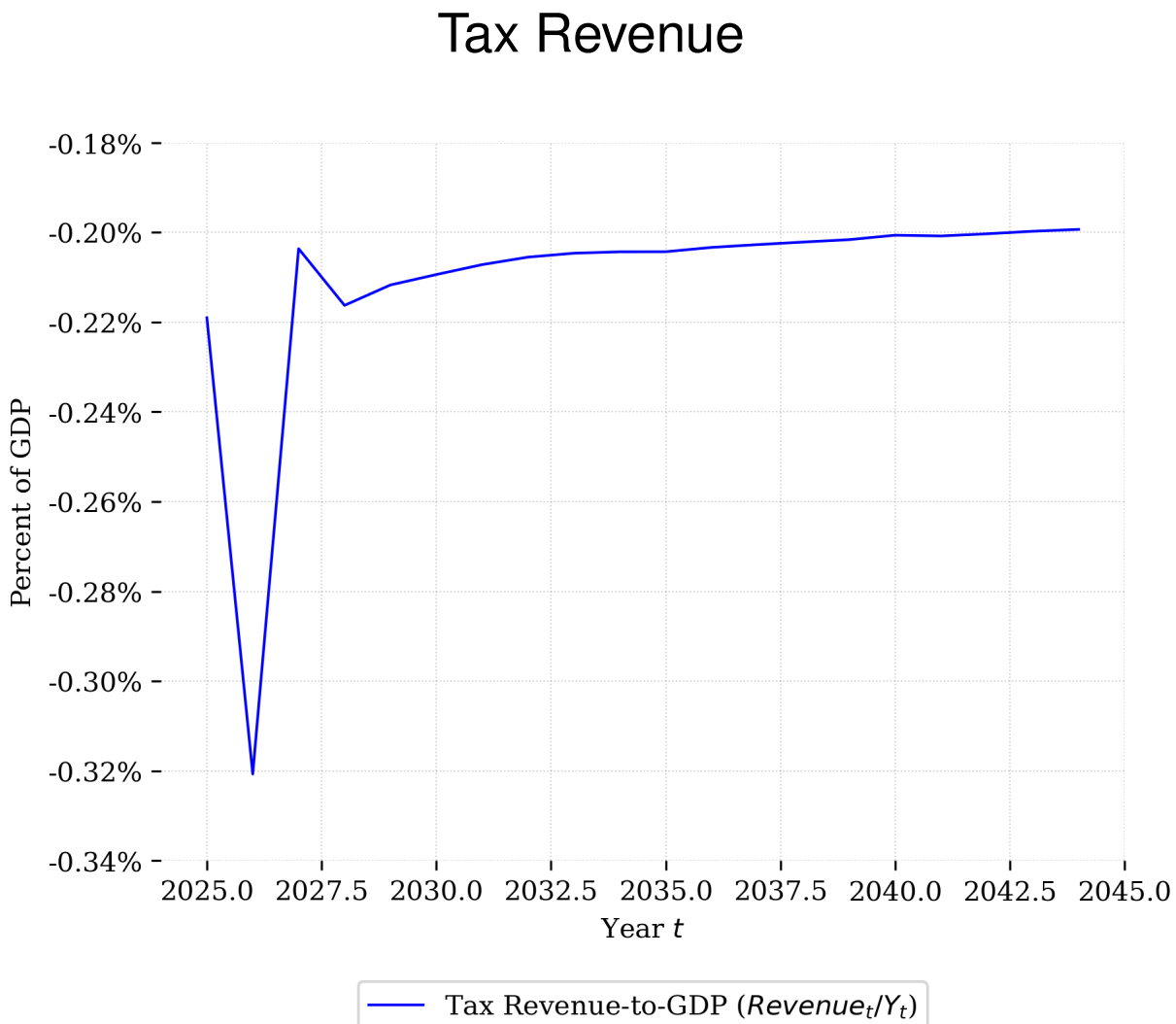
CIT Rate Cut: Parameterization

```
# Lower CIT to 25% in all sectors
updated_params_ref = {
        "cit_rate": [[0.25, 0.25, 0.25, 0.25]],
        "baseline_spending": True,
    }
p2.update_specifications(updated_params_ref)
```

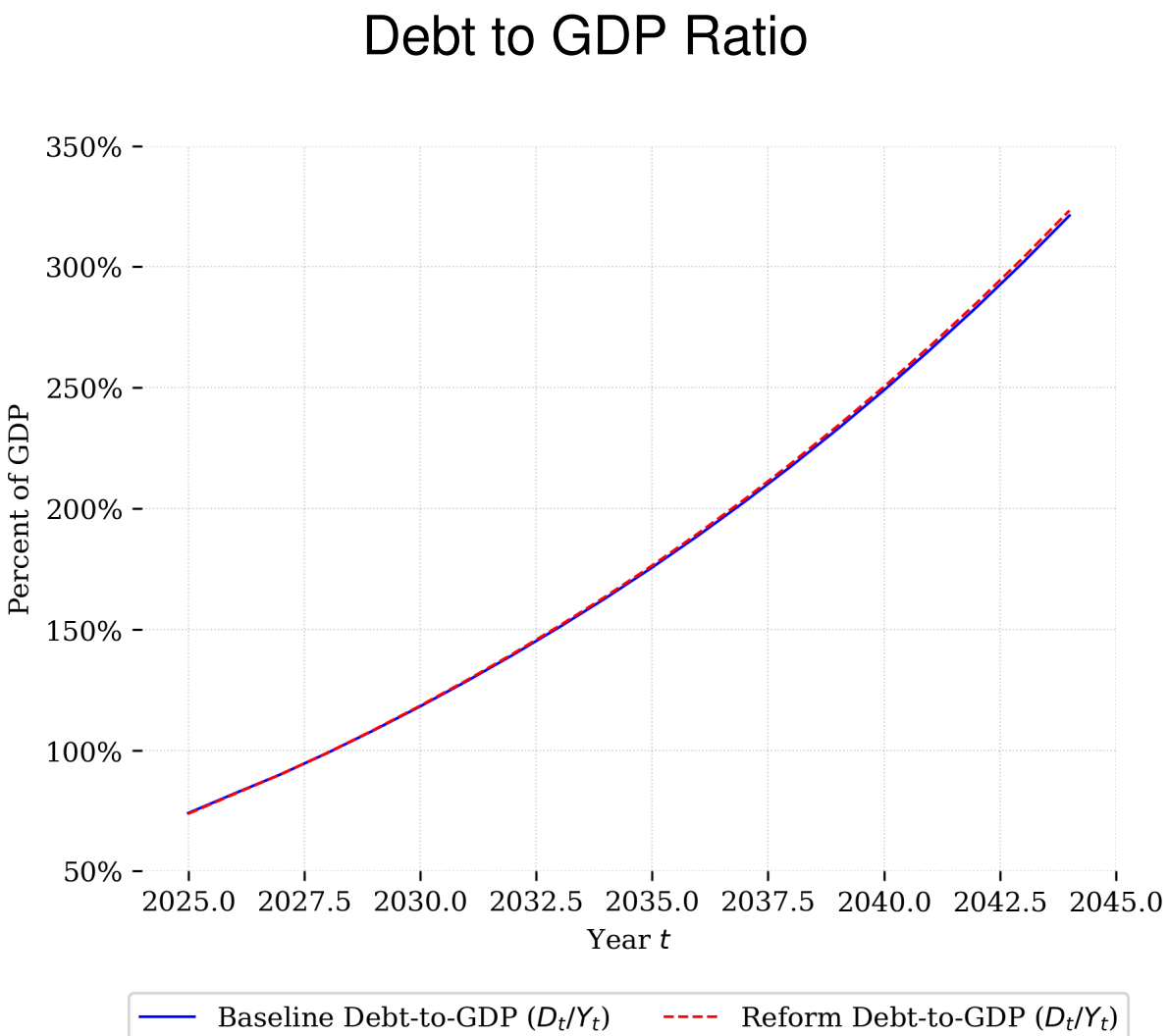
CIT Rate Cut: Results



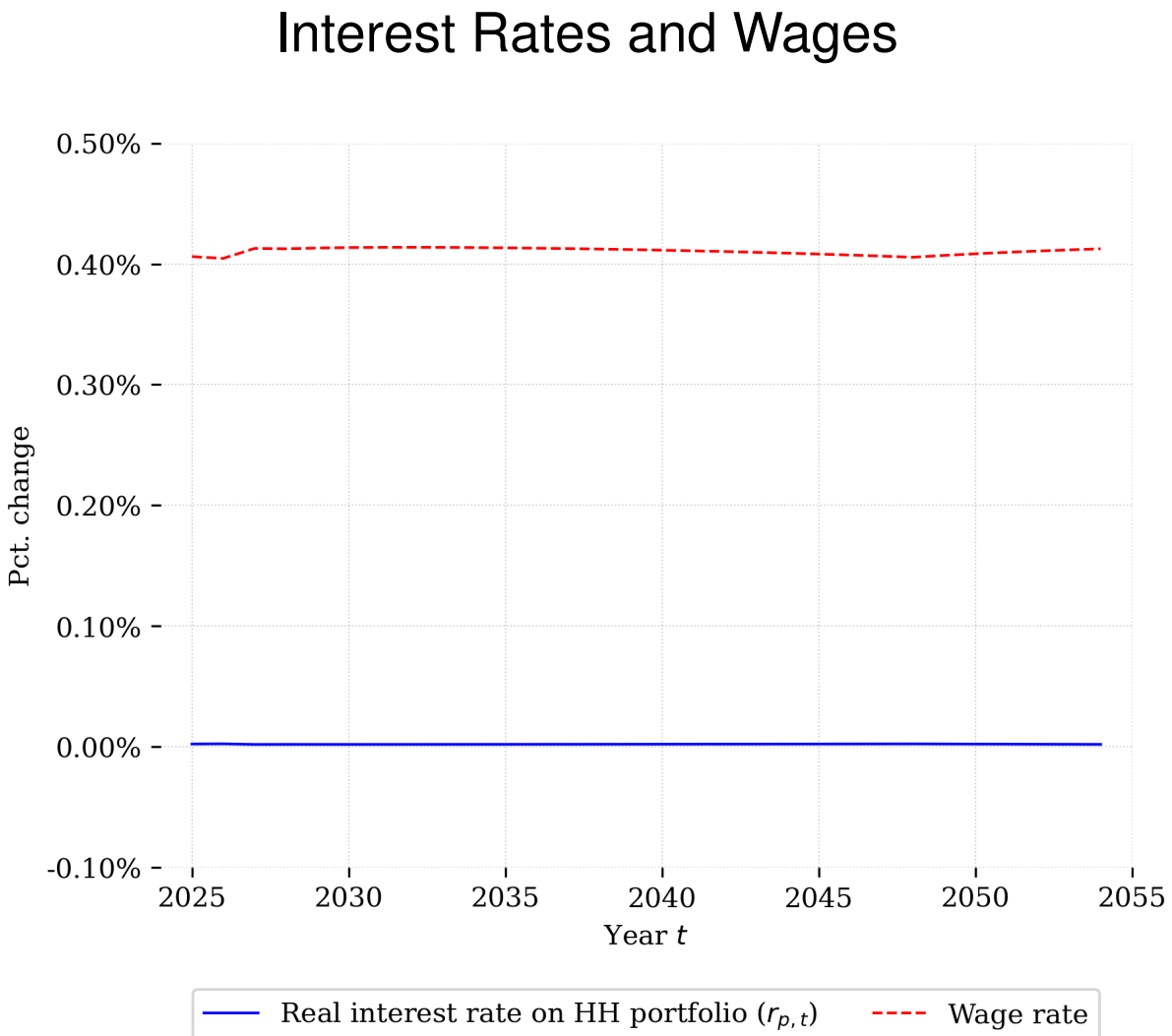
CIT Rate Cut: Results



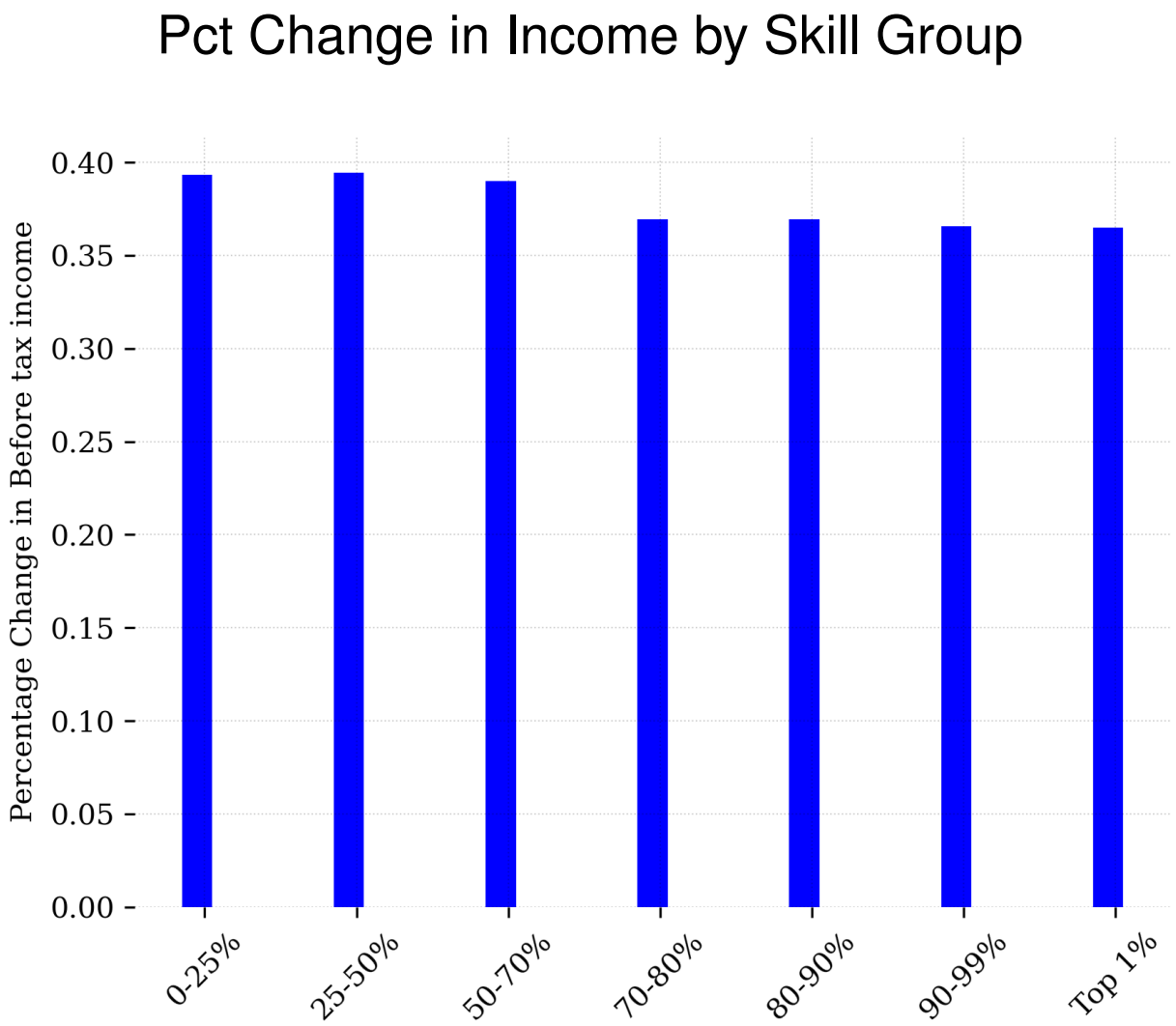
CIT Rate Cut: Results



CIT Rate Cut: Results



CIT Rate Cut: Results



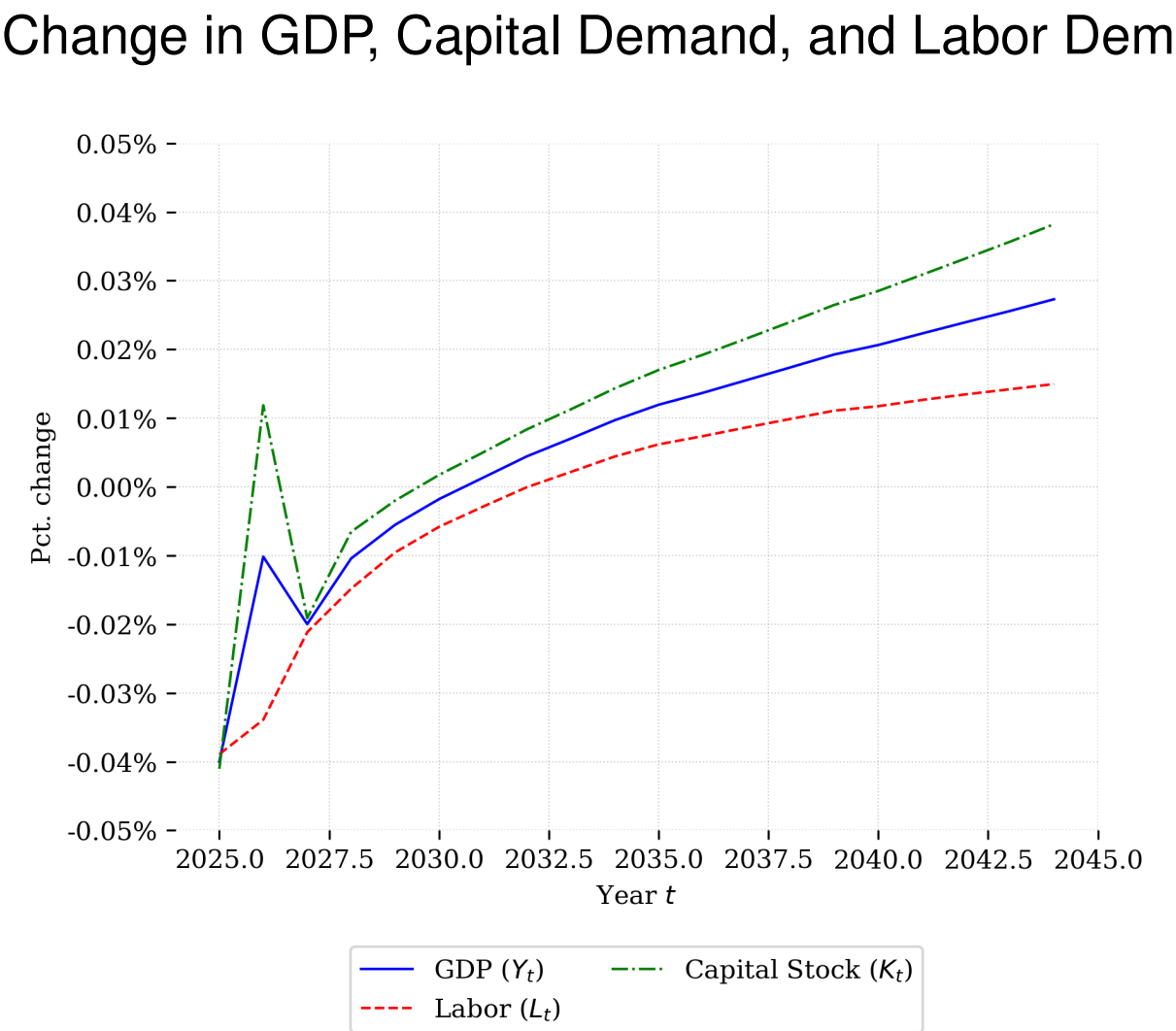
Energy Tax: Scenario

- Hypothetical: Phase in a tax on energy goods, as an increase in VAT rate
- Specifically: Tax begins at 15%, then 17%, then to 20% permanently

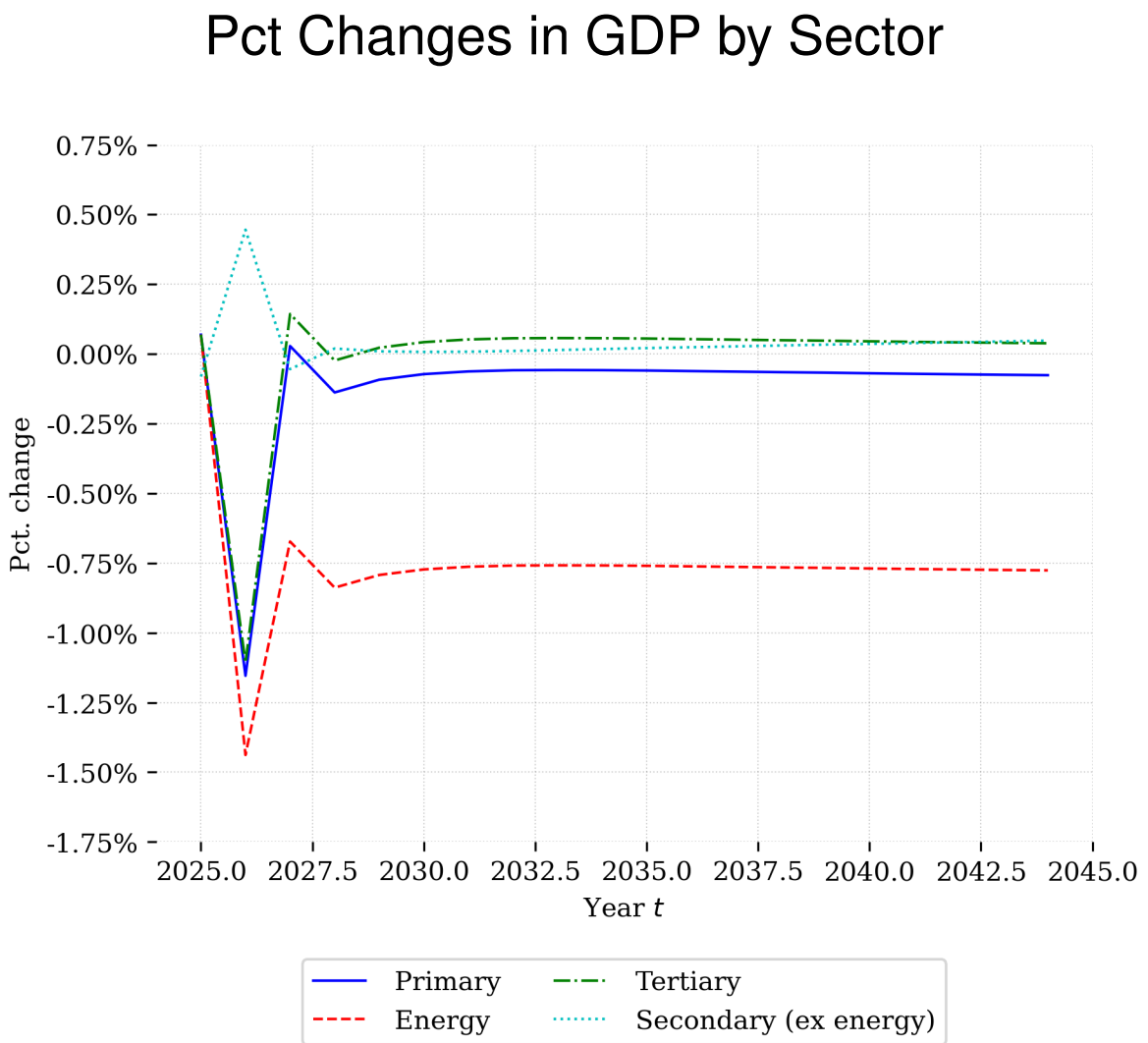
Energy Tax: Parameterization

```
# Change VAT on energy goods
# 5 types of consumption goods: Food, Energy and
    extraction,
# Non-durables, Durables, Services
updated_params_ref = {
    "tau_c": [
        [0.15, 0.15, 0.15, 0.15, 0.15],
        [0.15, 0.17, 0.15, 0.15, 0.15],
        [0.15, 0.20, 0.15, 0.15, 0.15],
    ],
    "baseline_spending": True,
}
p2.update_specifications(updated_params_ref)
```

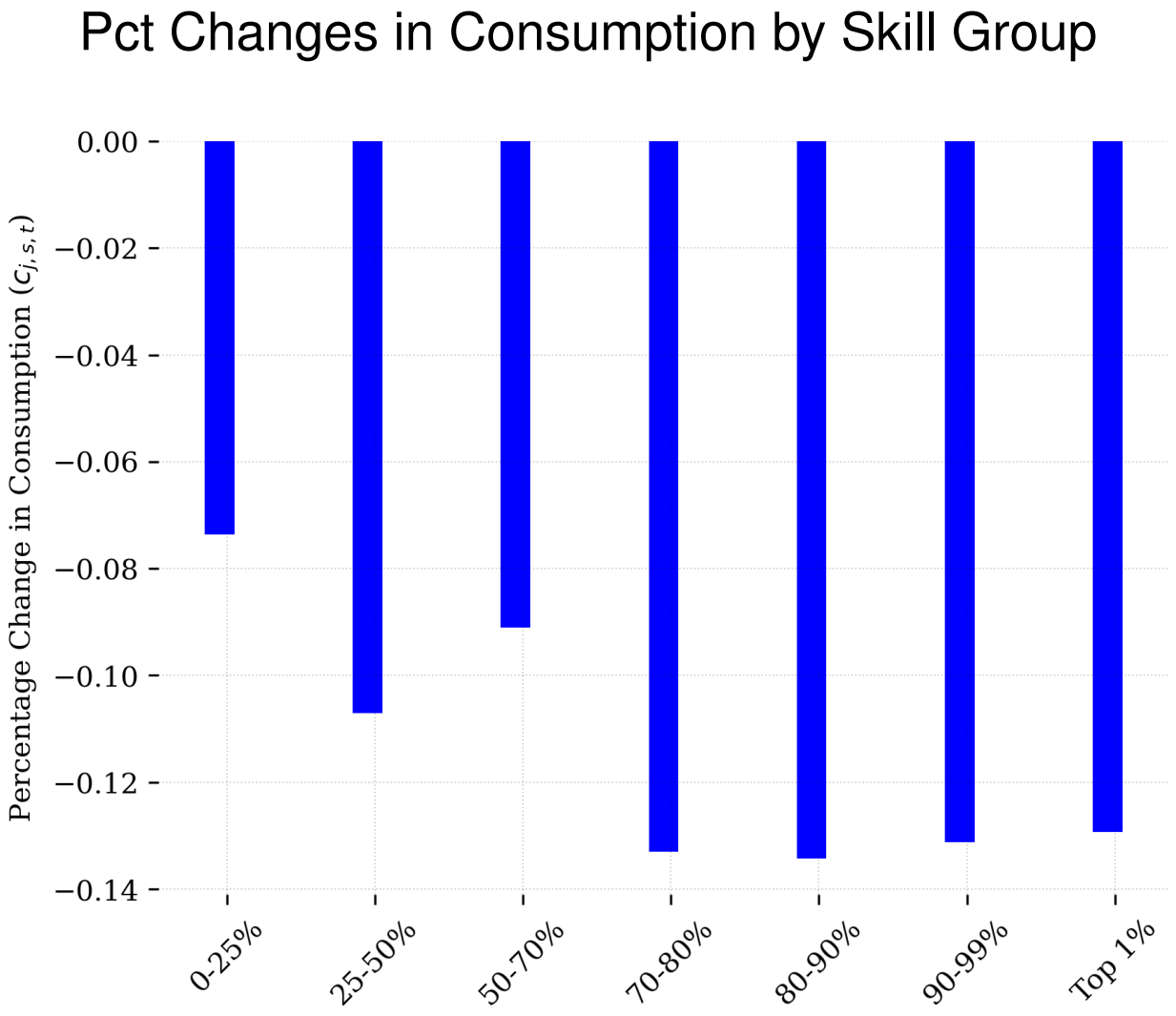
Energy Tax: Results



Energy Tax: Results



Energy Tax: Results



Education Reform: Scenario

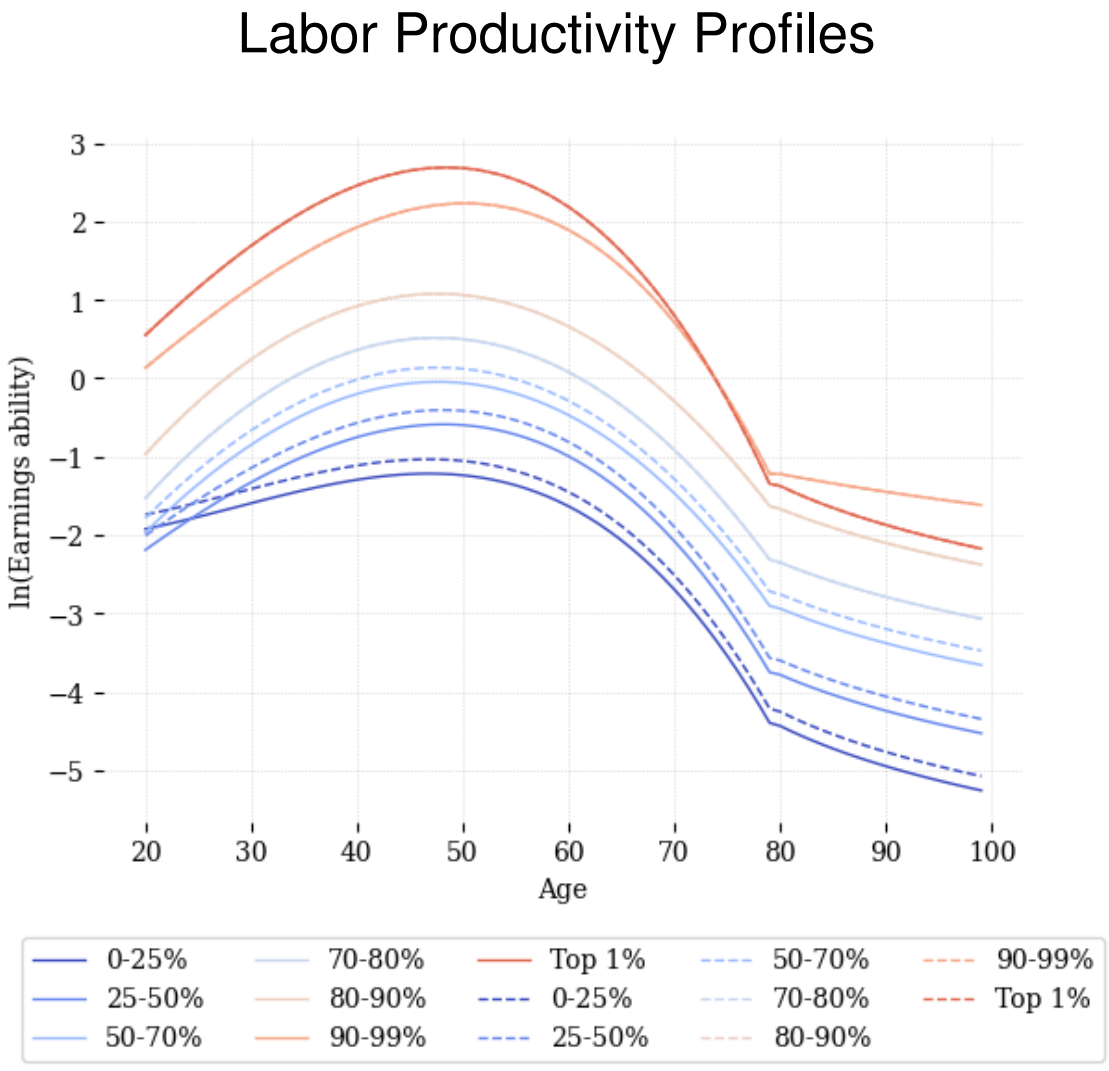
- Hypothetical: Increase public spending to obtain universal enrollment in South Africa
- Increased education $\rightarrow$ increase labor productivity
  - Specifically, productivity of bottom 70% increases by 20
  - This takes time to phase in as school age children now as in progress, don't find full benefit (assume 20 years)
  - Affects only bottom 70% since studies suggest those from higher income groups already attending school
- The spending affects the gov't budget: this education reform costs and additional 3.4% of GDP **permanently** (a pure guess)

Education Reform: Parameterization

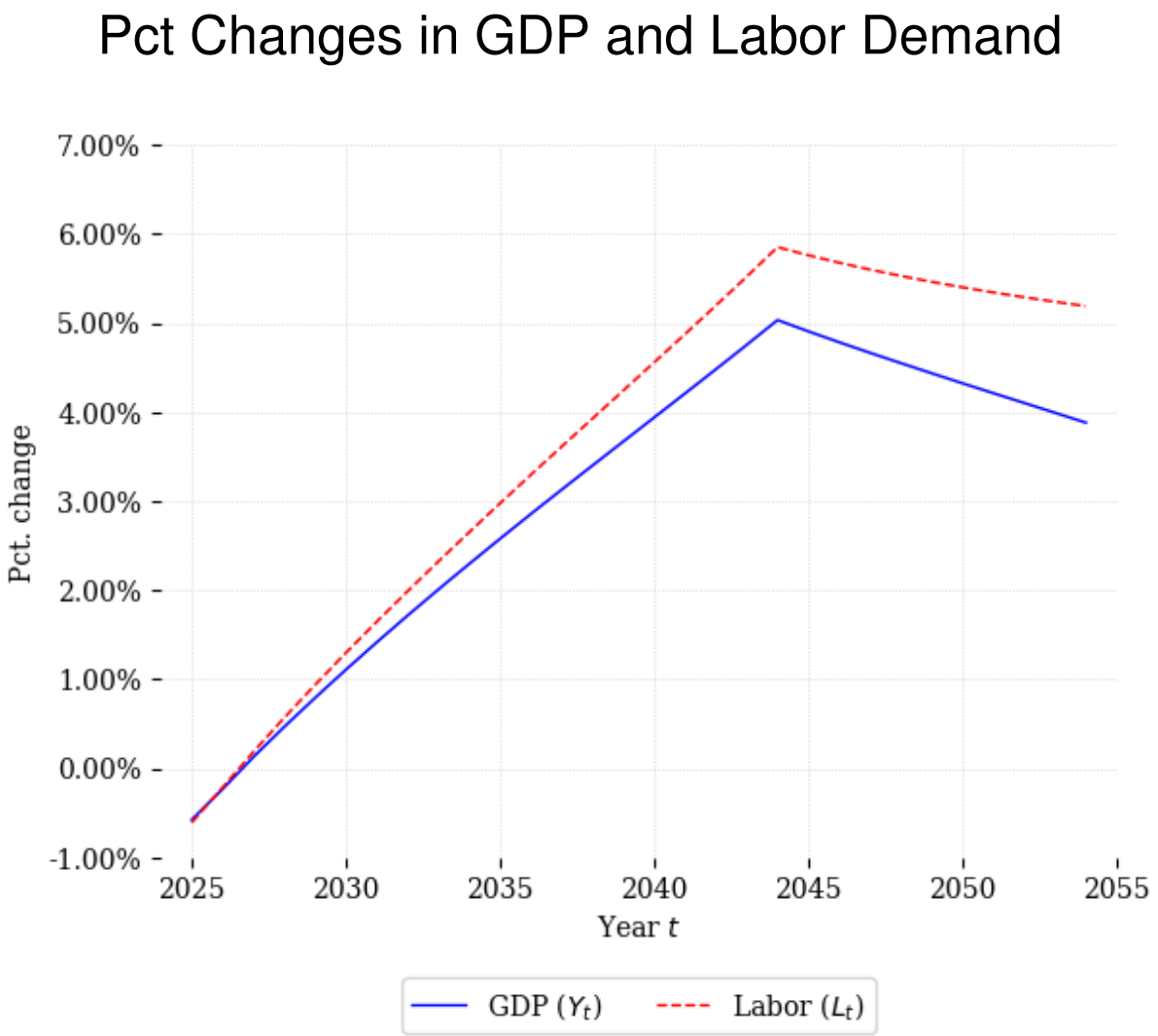
```
num_years = 20  # 20 years to phase in
total_benefit = 0.2  # total effect on productivity when
    fully phased in
benefits = np.linspace(0, total_benefit, num_years)
for t, benefit in enumerate(benefits):
    p2.e[t, :, :3] = p.e[t, :, :3] * (
        1 + benefit
    )  # just apply to bottom 70%
p2.e[num_years:, :, :3] = p.e[num_years:, :, :3] * (1 +
    total_benefit)

p2.alpha_G = (
    p2.alpha_G + 0.034
)  # counterfactual 10% of GDP - current 6.6% of GDP
```

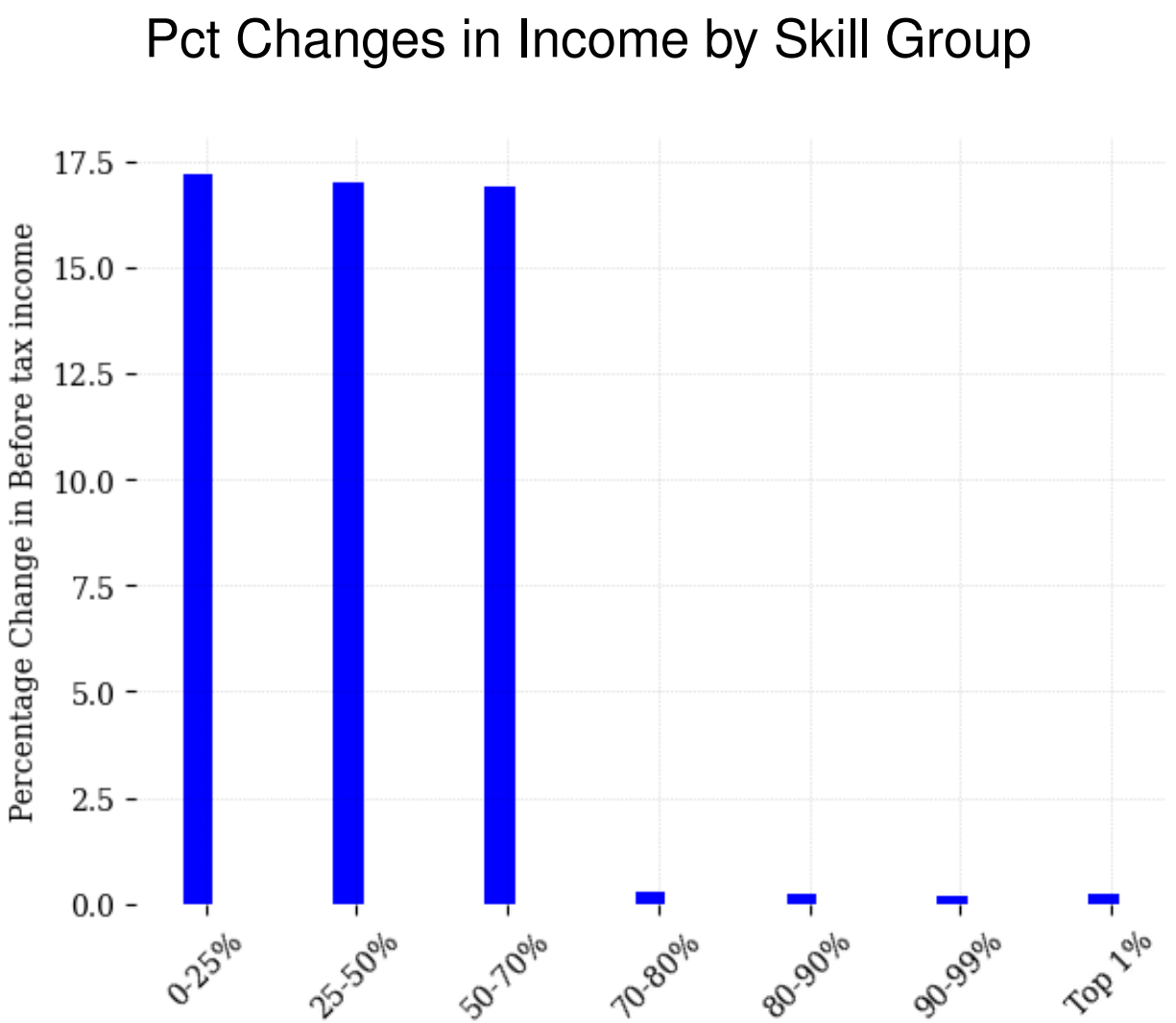
Education Reform: Parameterization



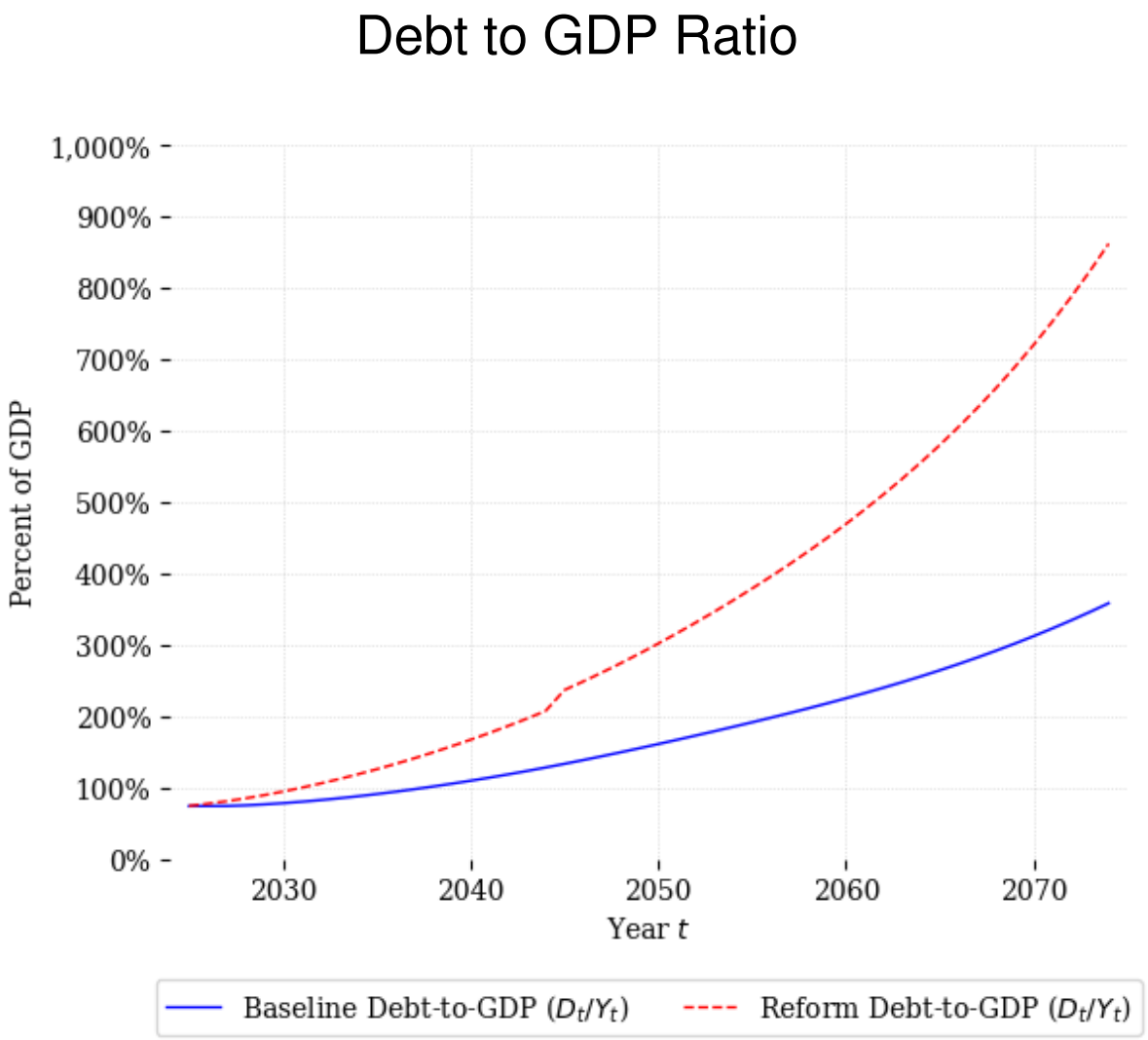
Education Reform: Results



Education Reform: Results



Education Reform: Results



Recent simulations in USA model

- Regulatory reform
- Effect of anti-aging therapeutic breakthroughs
- Debt stability

Simulations we could work on this week

- Changes to the social transfer system
- Debt stability (changes in taxes and/or spending to stabilize $\frac{D}{Y}$)
- Tax reform
- Education funding
- Infrastructure investment