OG-USA: Open Source Macroeconomic and Microsimulation Modeling of US Debt Sustainability

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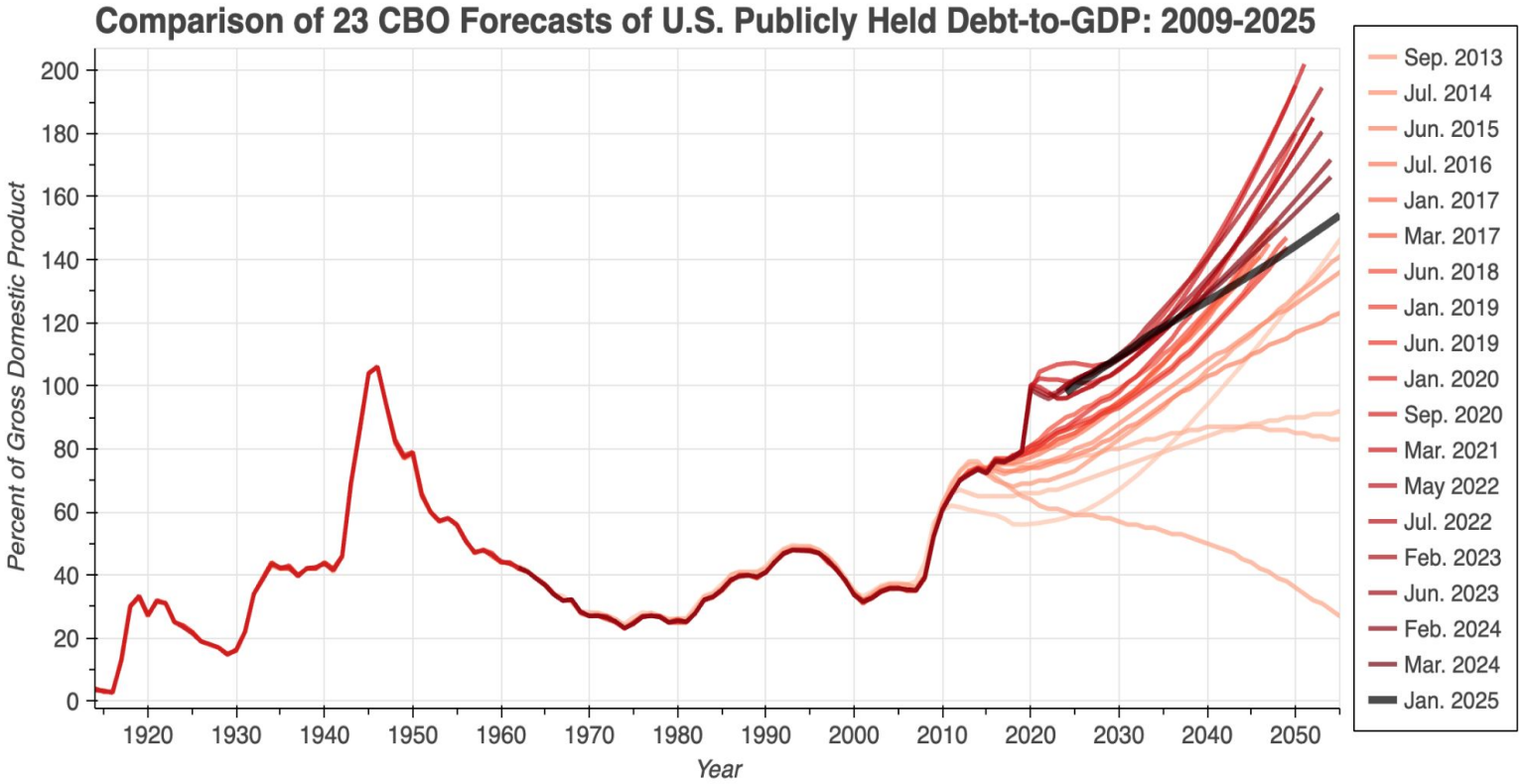
- **Senior Economist**, Abundance Institute [CV]
- **Education**
  - University Texas at Austin (PhD and MS), BYU (MA and BA)
- **Academic jobs**
  - University of Chicago (Assoc. Director), Brigham Young University (Asst Prof),
- **Think Tanks/Institutes/Centers**
  - Becker Friedman Institute; American Enterprise Institute; Tax Policy Center; Center for Public Finance, Baker Institute for Public Policy, Rice University; Abundance Institute, University of Utah; Center for Growth and Opportunity, Utah State University
- **Government**
  - Joint Economic Committee, Federal Reserve Bank of Dallas
- **Consulting**
  - United Nations, World Bank, European Commission
- **Open source maintainer**



Source: U.S. publicly held debt-to-GDP forecasts (extended baseline) from Congressional Budget Office Long-term Budget Outlook reports in data associated with underlying figures, Long-term Budget Projections Data (https://www.cbo.gov/data/budget-economic-data#1), and Historical Budget Data (https://www.cbo.gov/data/budget-economic-data#2). Richard W. Evans (@rickecon).

Jan. 2025 forecast:

Debt/GDP expected to grow

2025: **100%**

2045: **135%**

2055: **154%**

Click here for dynamic version

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Policy Questions about Debt Sustainability

- What would be the effect of TCJA permanence?

- To stabilize debt/GDP at 120% by 2045:
  - How much would you have to raise taxes?
  - How much would you have to cut spending?
  - How much would economic growth have to increase?

- What would be the effect of deregulation in finance, banking, and environmental (NEPA)?

Use **OG-USA** and **Tax-Calculator** to answer these questions

OG-USA: Large scale macro model of US fiscal policy

- OG-Core: https://github.com/PSLmodels/OG-Core (documentation)
- OG-USA: https://github.com/PSLmodels/OG-USA (documentation)
  - Incorporates microsimulation model inputs (Tax-Calculator, PolicyEngine-UK, TPC)
- Jason DeBacker and Richard Evans: core maintainers since 2014
  - 26 contributors (see OG-Core and OG-USA)
- 20 cited use cases:
  - policy papers, peer-reviewed journal articles, working papers
- Calibrations in 8 other countries:
  - UK, India, Philippines, South Africa, Indonesia, Malaysia, Brazil, Thailand
  - United Nations, World Bank, European Commission
  - Interested in US state calibrations

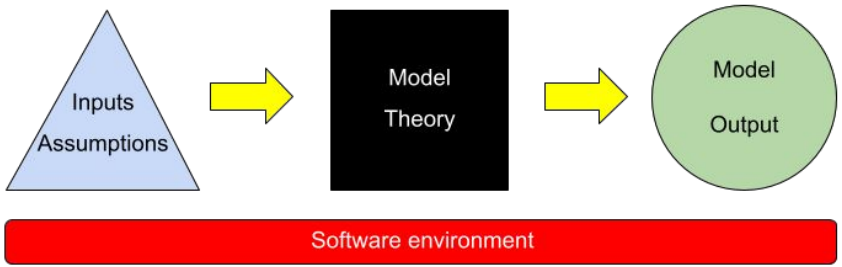
OG-USA: Large scale macro model of US fiscal policy

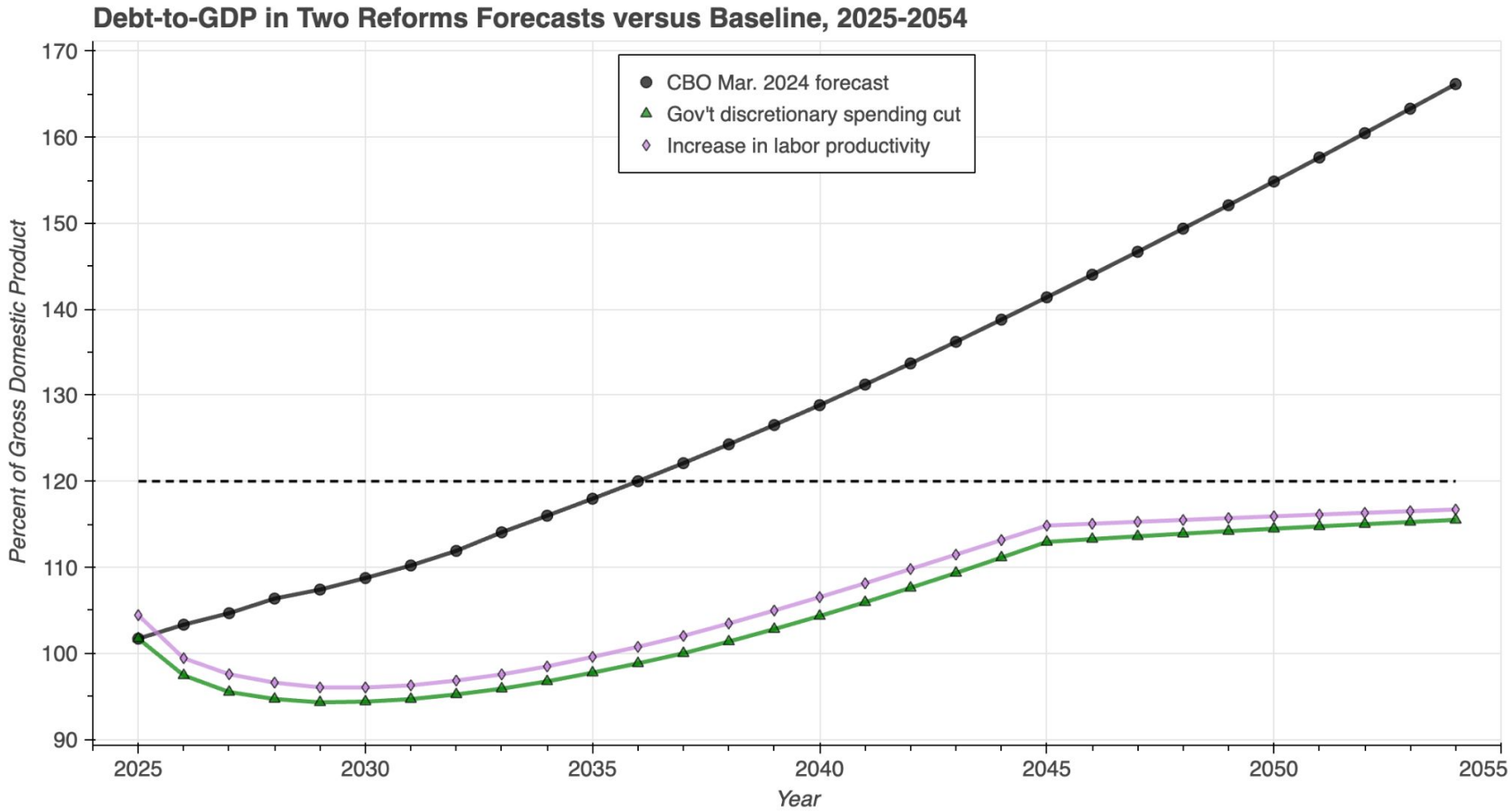
- Dynamic, general equilibrium, heterogeneous agent, overlapping generations
- Households
  - Choose, consumption, savings, labor, leisure over lifetime (with mortality risk)
  - Face taxes, receive government transfers, receive bequests
- Demographics
  - Mortality, fertility, and immigration rates by age => population by age
- Producers/Businesses/Industries
  - Multiple calibrated industries
  - Business taxes
- International flows of capital
  - Foreigners can buy government debt, rent private capital, and send or receive remittances
- Government
  - Individual and business taxes
  - Government spending: discretionary, household transfers, infrastructure, Social Security
  - Surplus/Deficit/Debt

See the documentation of the theory

OG-USA: How to run the model, baseline scenario

- OG-USA example run script (`run_og_usa.py`). My analysis run script (`us_2025.py`).
  - (Environment) Create environment and import packages
  - (Environment) Set up parallel processing for high performance computing
  - (Environment) Define directories from which data and inputs are taken and to which output is saved
  - (Inputs/Assumptions) Instantiate a parameters object and update parameters
  - (Inputs/Assumptions) Calibrate other inputs/assumptions (demographics, tax rates)
  - (**Equilibrium, solution algorithm, theory**) Run the model for the baseline (steady-state, transition path)





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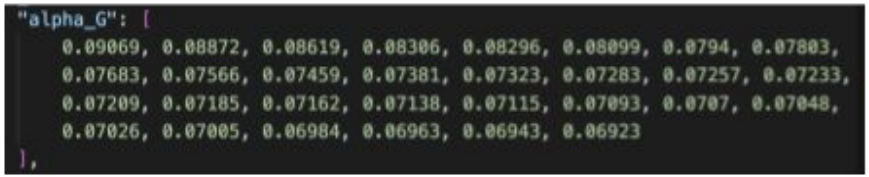
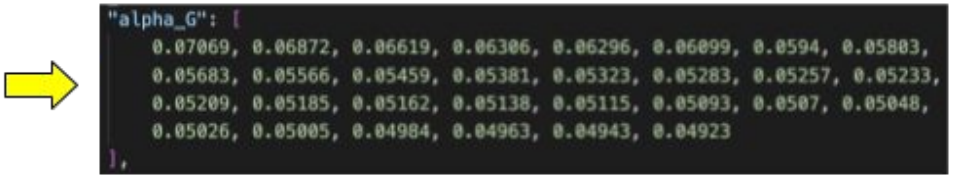
Question 1: How big a tax increase?

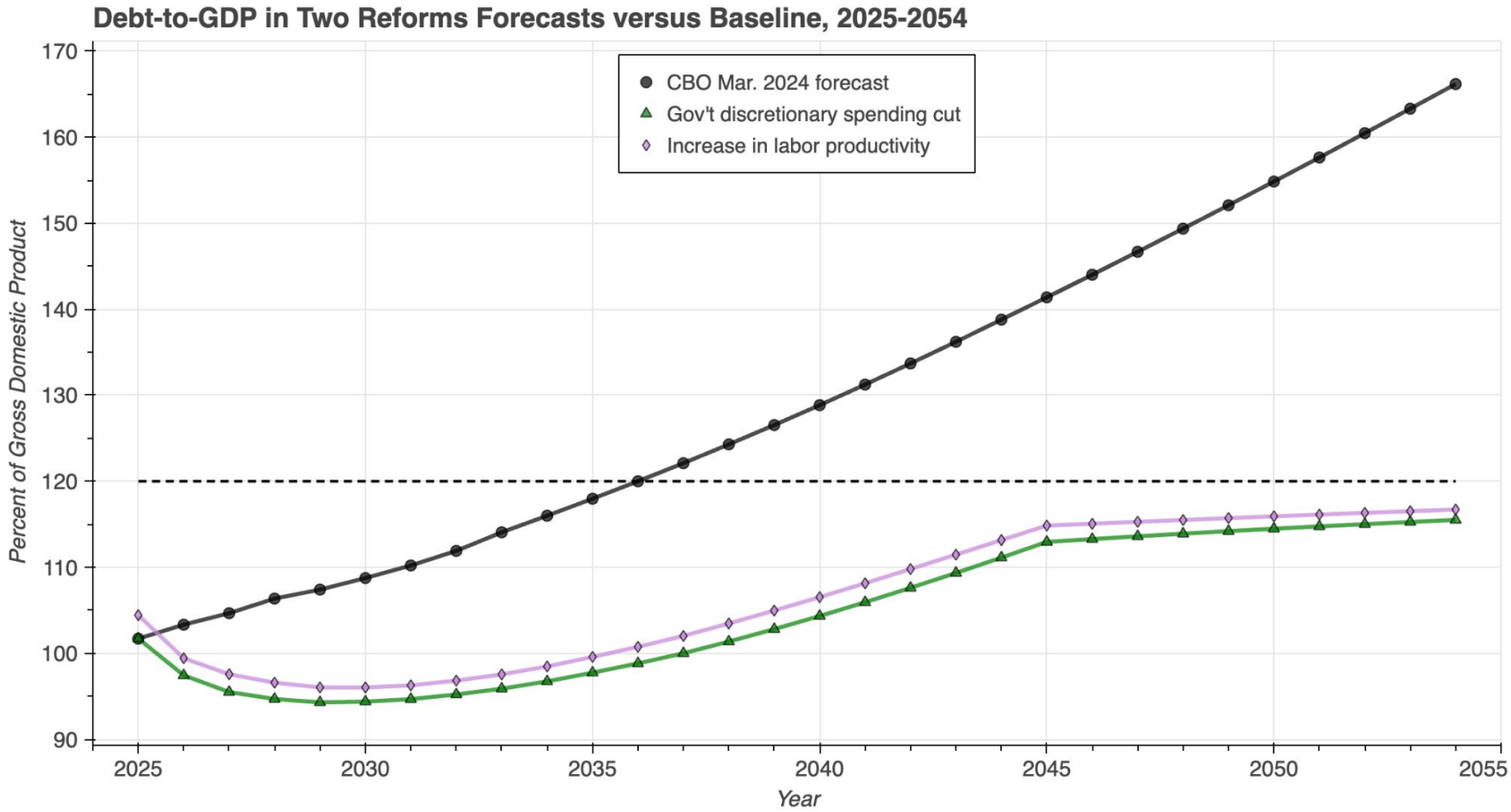
- How much would government have to increase taxes to stabilize debt/GDP at 120% by 2045?
  - Did not run this for the current simulations
  - Results from January 2024:
    - **Increase taxes on individuals and corporations by 34%**
    - Example: top individual tax rate from 37% to 50%

Question 2: How big a spending cut?

- How much would government have to decrease discretionary spending to stabilize debt/GDP at 120% by 2045?
  - Cut government spending by $660 billion, from discretionary spending of 9% of GDP in 2026 to 7%
  - This would be hard to get to. But not crazy. DOGE not likely to do this.
  - Show us_2025.py and us_2025_refG_params.json.







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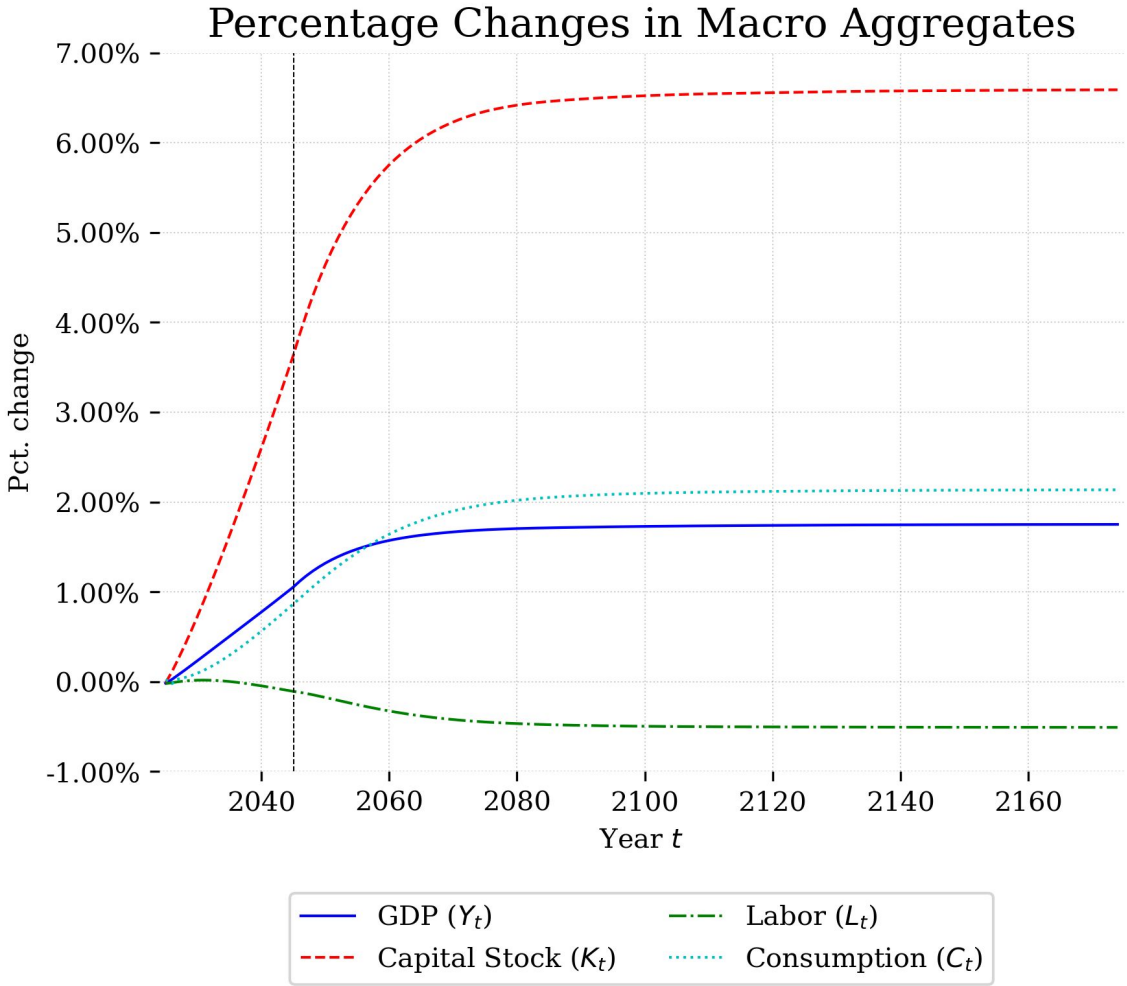
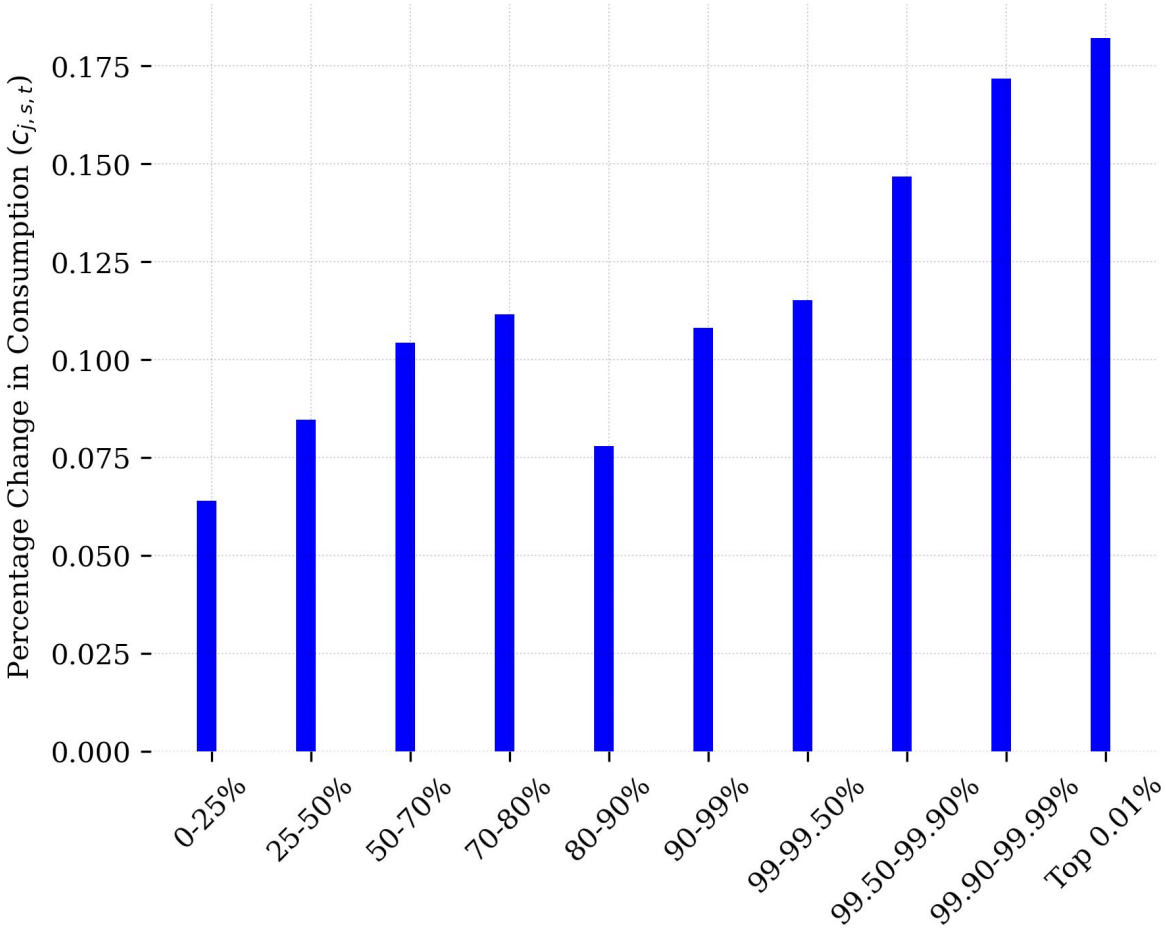
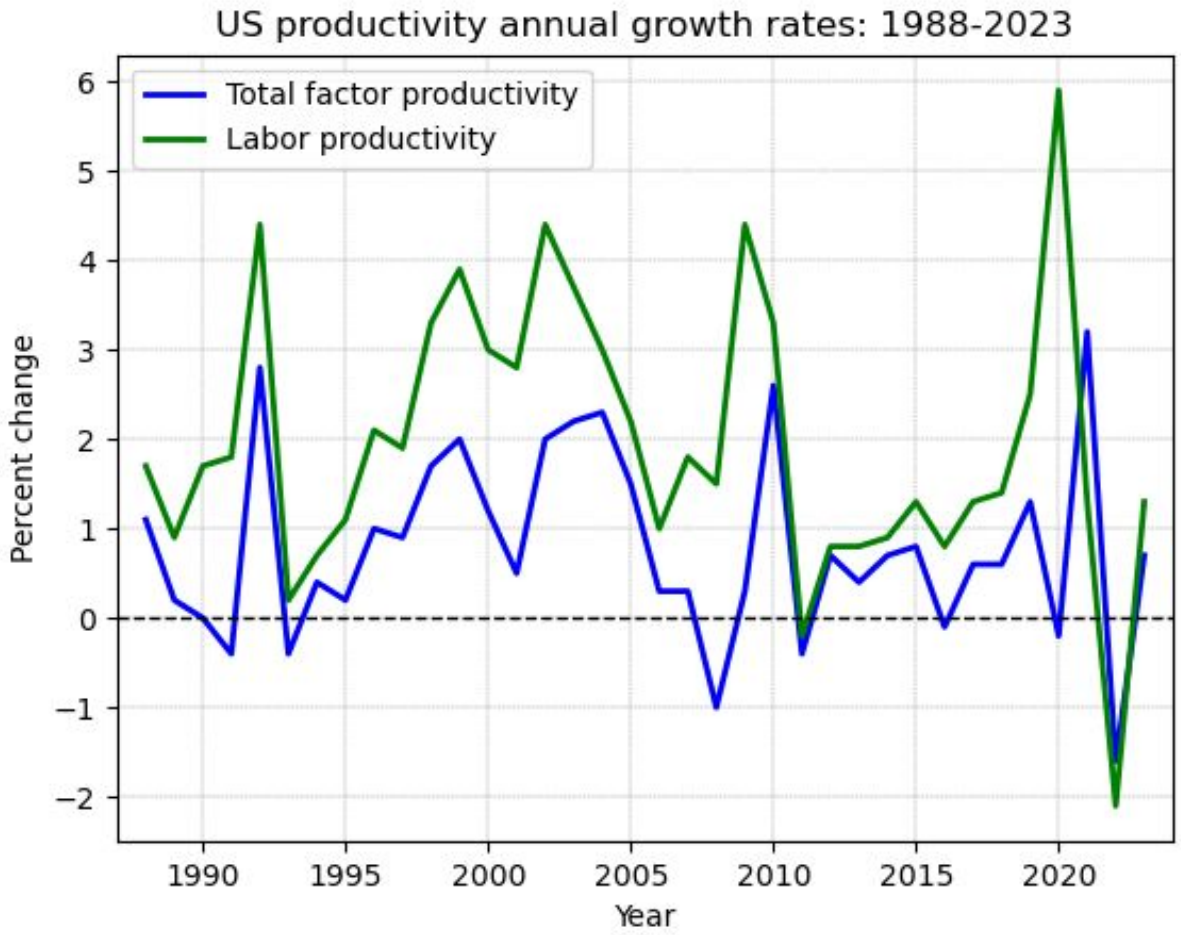

Percentage Changes in Macro Aggregates
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
GDP (Y_t)
Capital Stock (K_t)
Labor (L_t)
Consumption (C_t)


Percentage changes in consumption
Percentage Change in Consumption ($c_{j,s,t}$)
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0-25%
25-50%
50-70%
70-80%
80-90%
90-99%
99-99.50%
99.50-99.90%
99.90-99.99%
Top 0.01%

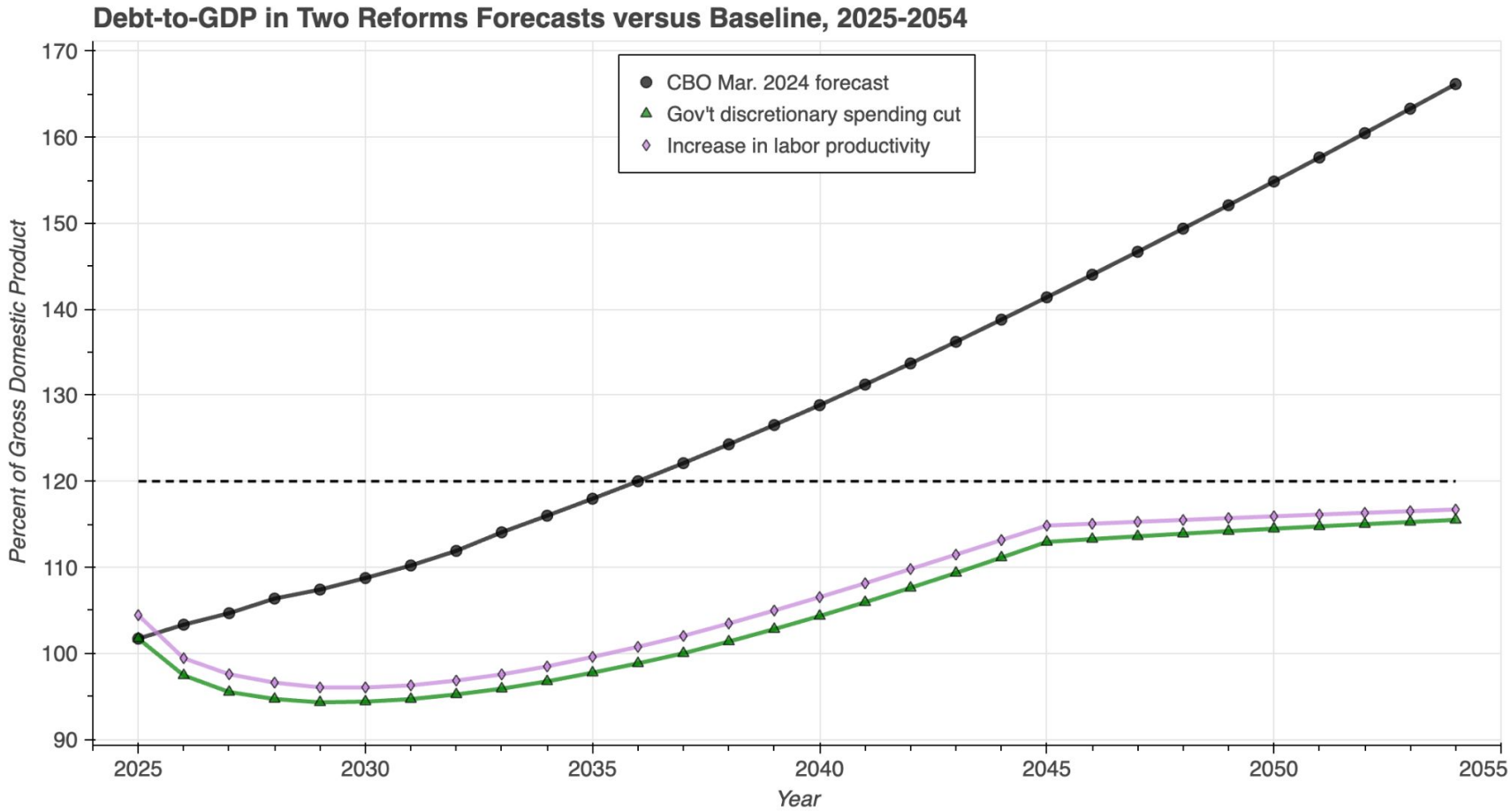
Question 3: How big a productivity growth increase?

- How much would average labor productivity growth rate need to increase to stabilize debt/GDP at 120% by 2045?
  - Increase the average labor productivity growth rate to 5% per year, up from current 2% per year
  - This would be unprecedented. Maybe AI can get us there.
  - Show us_2025.py and us_2025_refgr_params.json.



Question 3: How big a productivity growth increase?

Growth in labor productivity only above 5% in 2020



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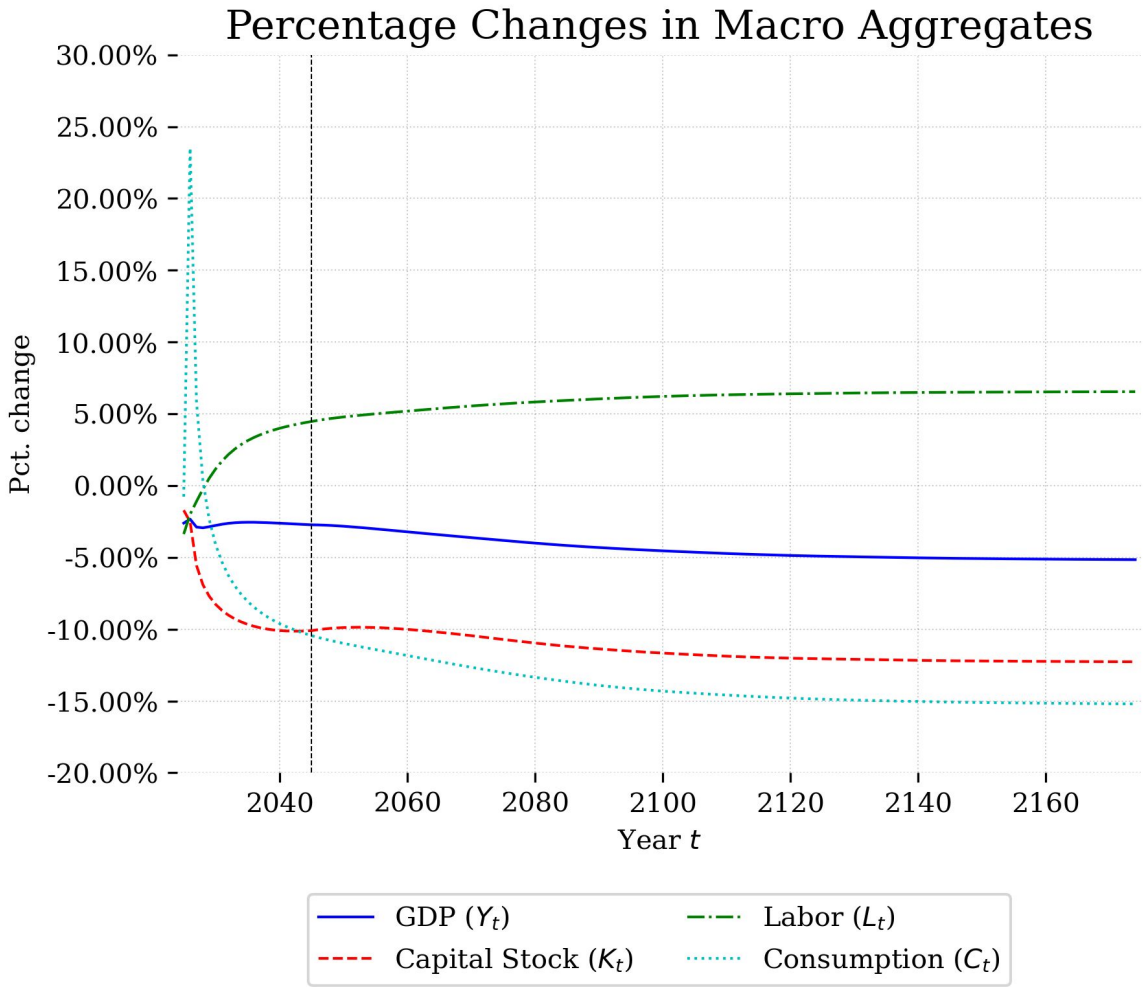
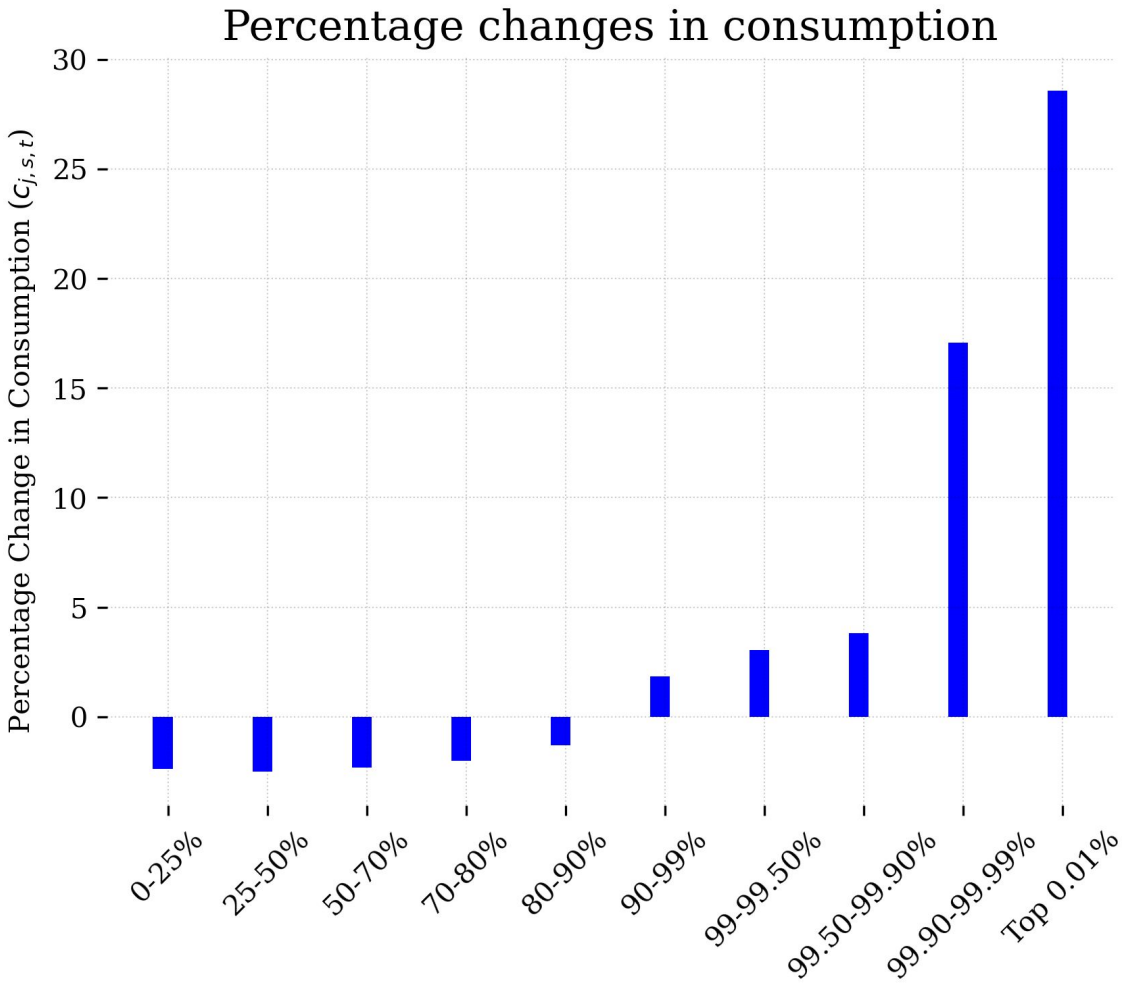
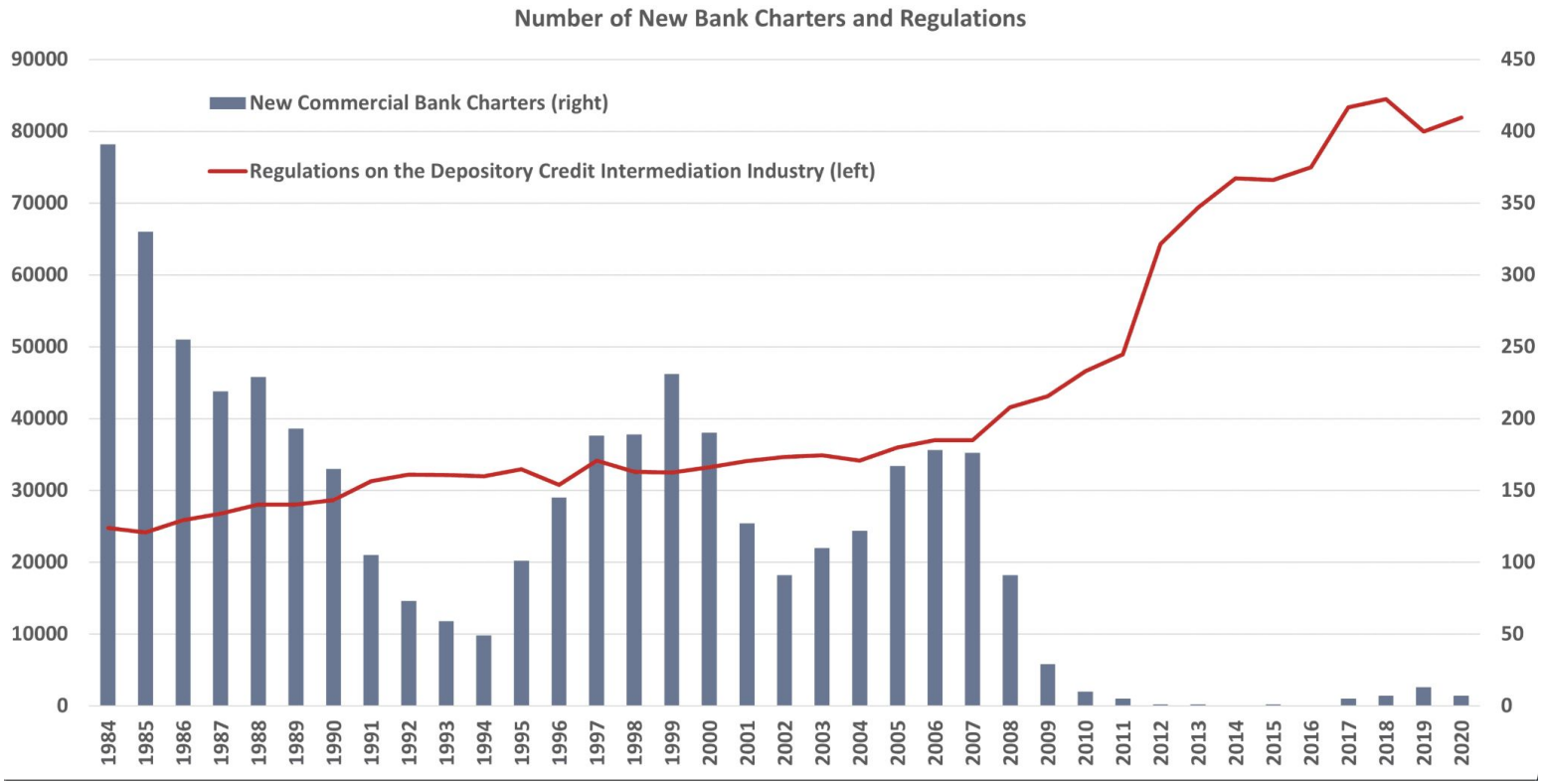



Percentage changes in consumption
Percentage Change in Consumption ($c_{j,s,t}$)
30
25
20
15
10
5
0
0-25%
25-50%
50-70%
70-80%
80-90%
90-99%
99-99.50%
99.50-99.90%
99.90-99.99%
Top 0.01%

Question 4: What is effect of regulatory reform?

- NEPA (National Environmental Policy Act)
  - Interim Executive Order 12866 proposes to remove it
  - Industries = 21.2% of GDP
    - Energy, Mining, Utilities, Transportation and Warehousing, Construction, Manufacturing
- Financial reform
  - Industries = 20.7% of GDP
    - Finance, Banking, and Insurance
  - Dodd-Frank compliance, Crypto
- A 5% increase in the level of TFP (not the growth rate) might not be crazy

American Action Forum Chart (couldn't find citation)



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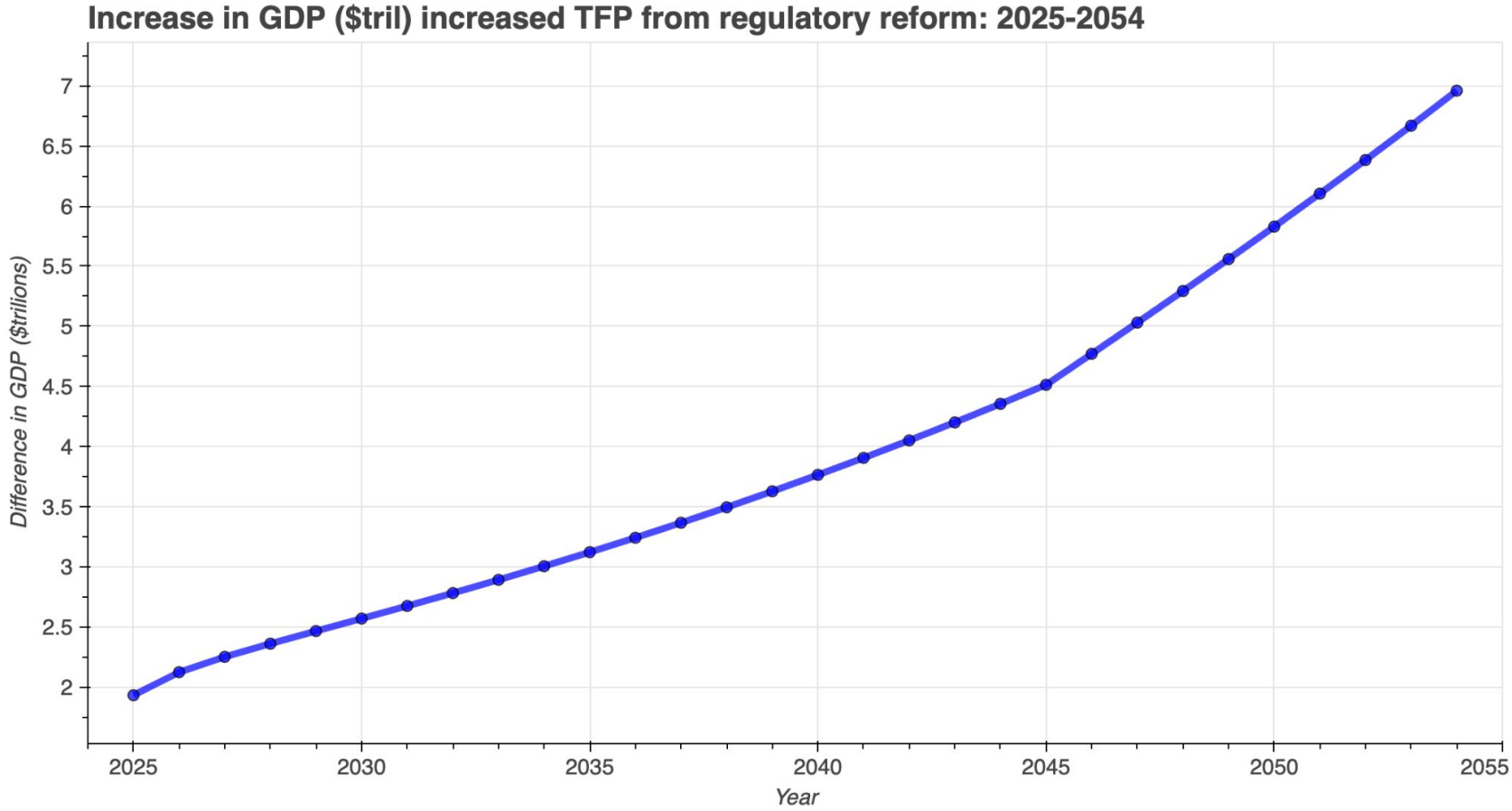
Increase in GDP ($tril) increased TFP from regulatory reform: 2025-2054
Difference in GDP ($trillions)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
2025
2030
2035
2040
2045
2050
2055
Year