Macroeconomic Consequences of Disasters in the Philippines: OG-PHL Simulations

Philip Arnold P. Tuano[1]
Gay D. Defiesta[2]
Jhon Louie B. Sabal[3,1]
Christian C. Pasion[4]
Joe Mari S. Francisco[5]
Paolo Magnata[1]
Cymon Kayle Lubangco[1,6]

[1]Ateneo de Manila University, [2]University of the Philippines – Visayas, [3]Xavier University – Ateneo de Cagayan, [4]Ateneo de Davao University, [5]Institute for Labor Studies, [6]Bangko Sentral ng Pilipinas

Background of the Study

- The Philippines is vulnerable to climate-induced disasters.
- Due to these devastating climate-induced events, we investigate the long-run effects on macroeconomic aggregates.

Research Question

What is the effect of a 100-year typhoon shock on the economy?

How will the economy adjust in the presence and absence of productivity enhancements after the disaster event?

Framework

Exogenous Shock: Severe Typhoon

Mechanism and Pathways:

- Earnings Ability → Reduced laborer's earning potential
- Disutility of Labor → Physical and Psychological Burden
- Total Factor Productivity → Capital Destruction + Supply Chain

Simulated scenarios

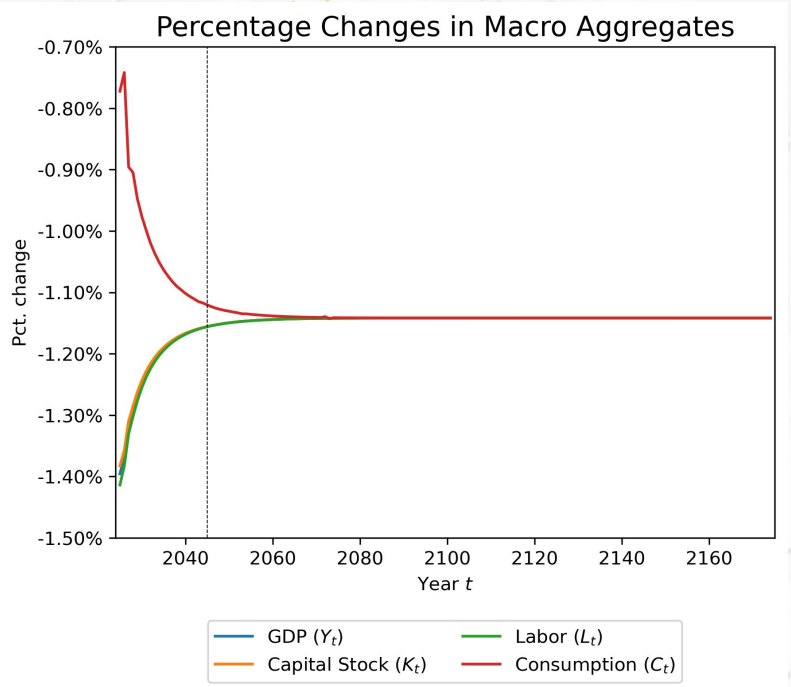
Scenario 1	Scenario 2	Scenario 3	Scenario 4
Baseline	Decrease in deterministic ability process (e) by 1% Increase in disutility of labor (chi_n) by 1% No change in total factor productivity (Z)	Decrease in deterministic ability process (e) by 1% Increase in disutility of labor (chi_n) by 1% Decrease in total factor productivity (Z) by 1%	Decrease in deterministic ability process (e) by 1% Increase in disutility of labor (chi_n) by 1% Increase in total factor productivity (Z) by 1%

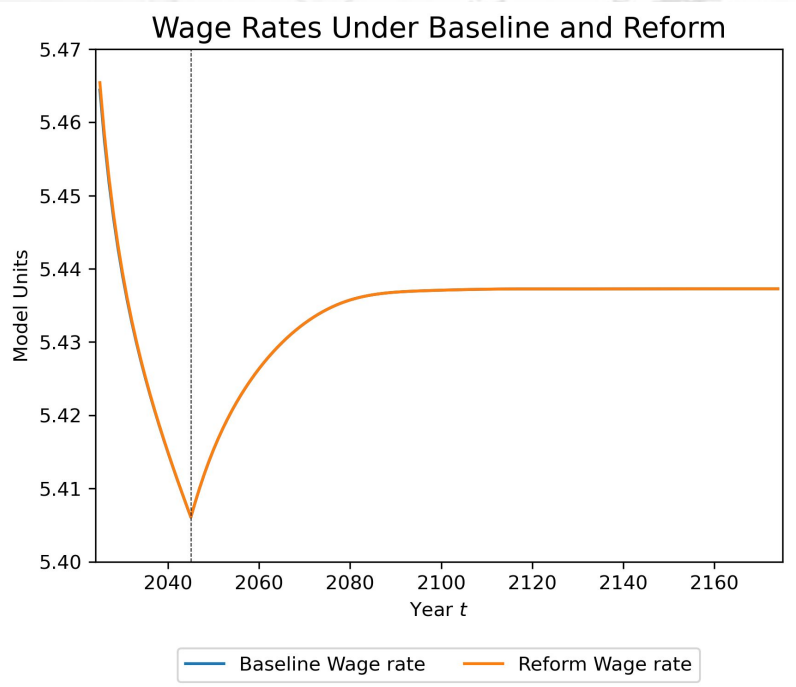
Simulated scenarios: codes

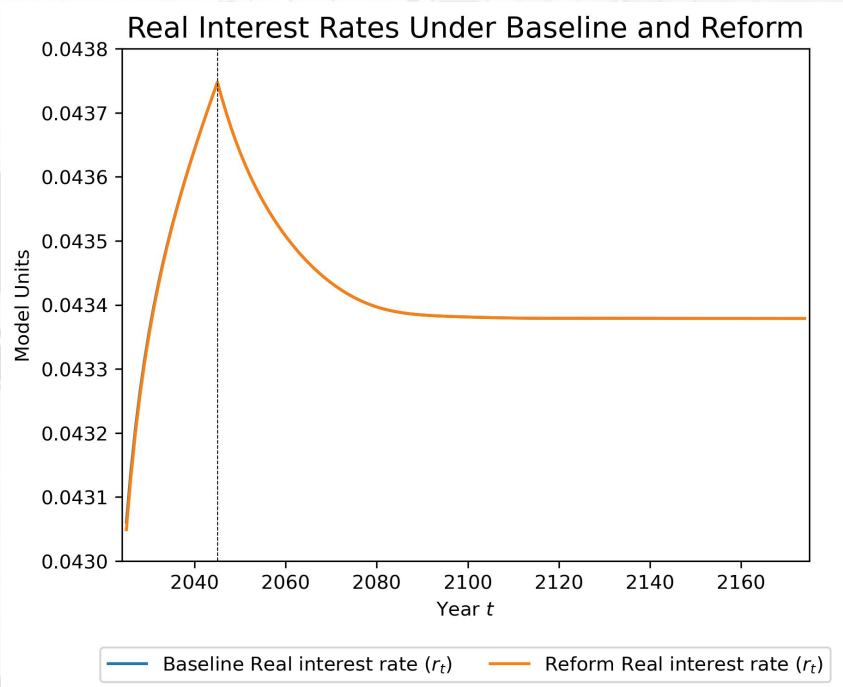
Scenario 2	Scenario 3	Scenario 4

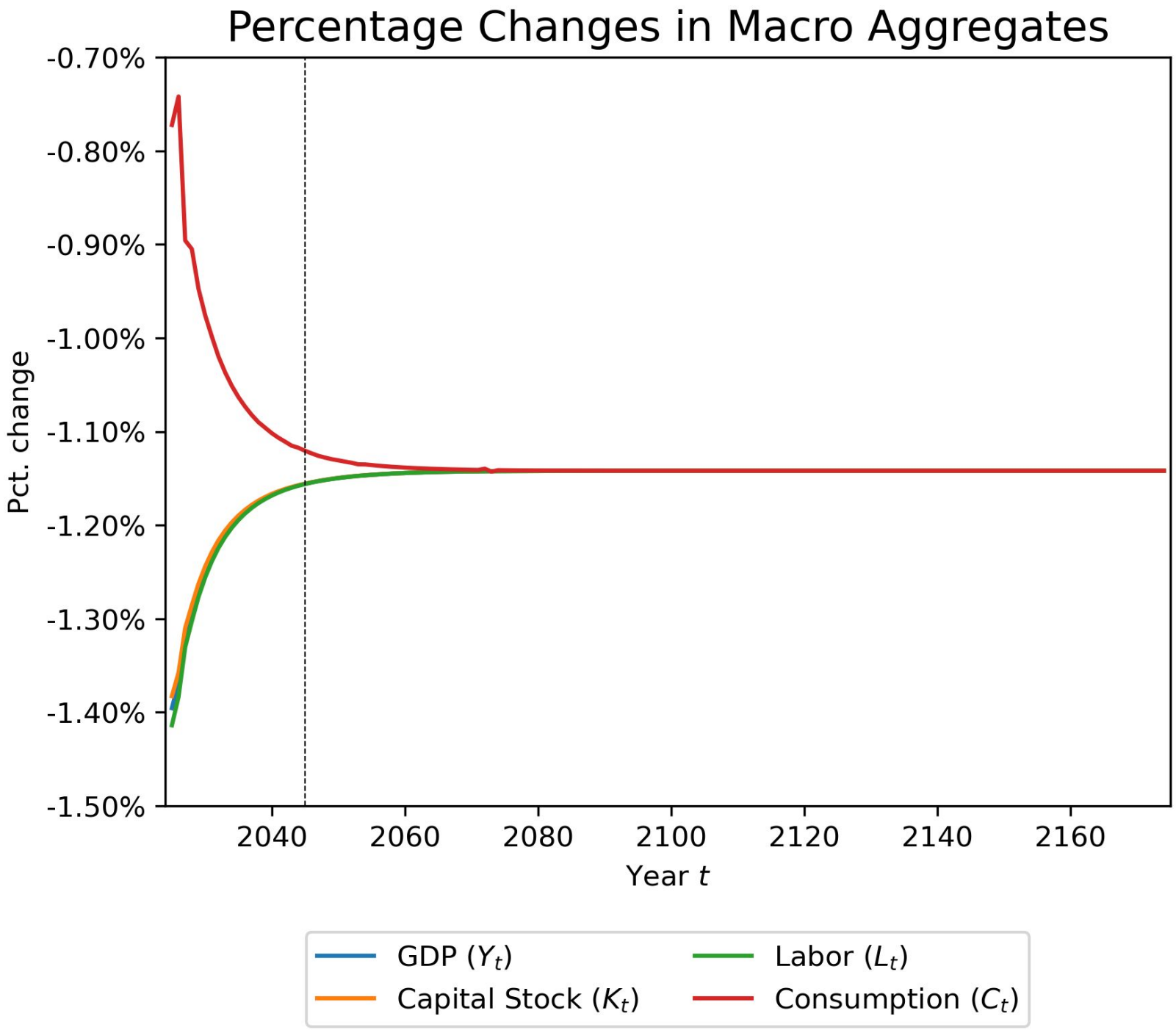
#reduced earning ability
p2.e = p.e*0.99
 	
#increased disutility of labor
p2.chi_n = p.chi_n*1.01
 	
#no change in TFP
	#reduced earning ability
	p2.e = p.e*0.99
	
	#increased disutility of labor
	p2.chi_n = p.chi_n*1.01
	
	#decreased in TFP
	p2.Z = p2.Z*0.99
		#reduced earning ability
		p2.e = p.e*0.99
		
		#increased disutility of labor
		p2.chi_n = p.chi_n*1.01
		
		#increased in TFP
		p2.Z = p2.Z*1.01

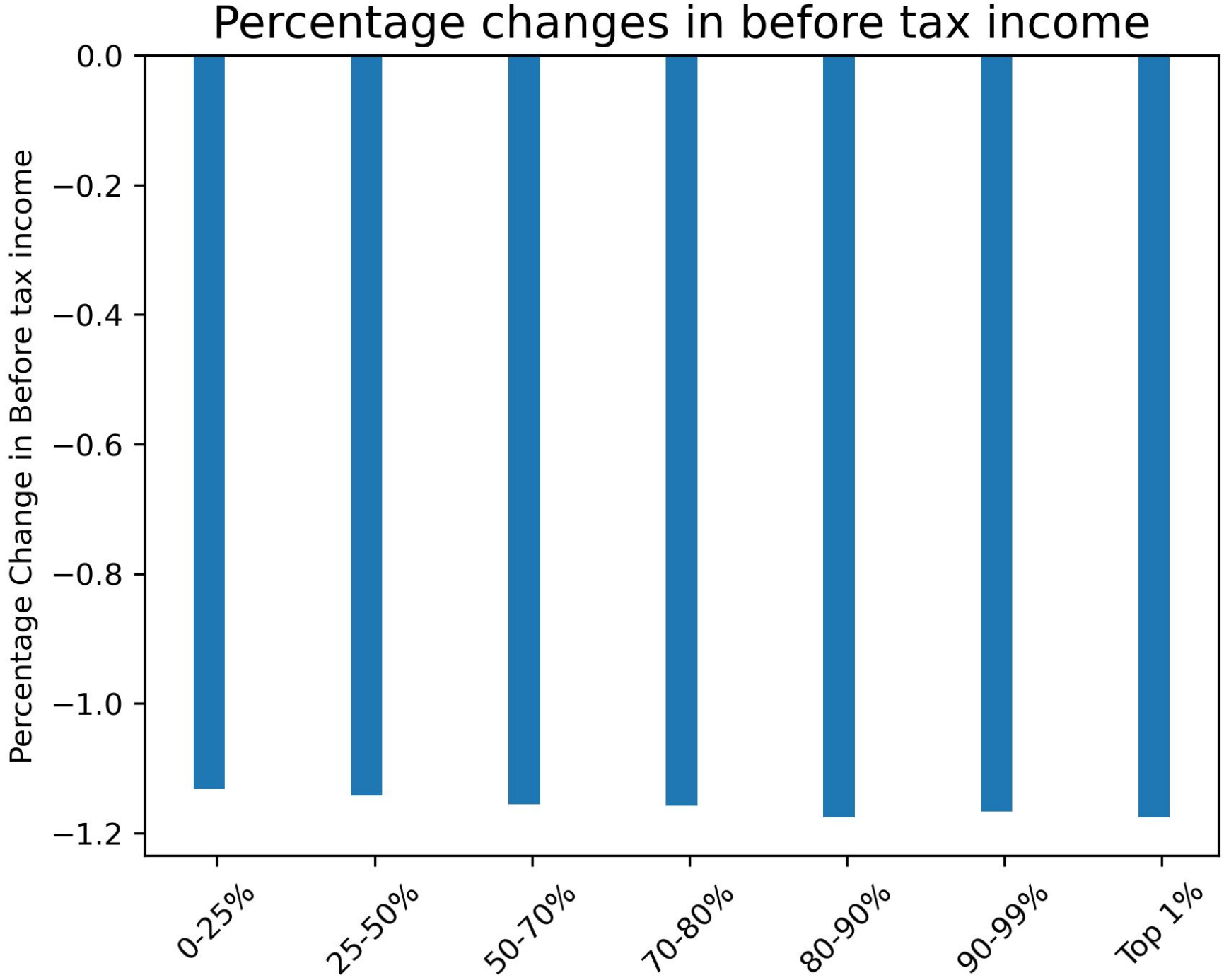
Scenario 2: A more accurate specification is needed

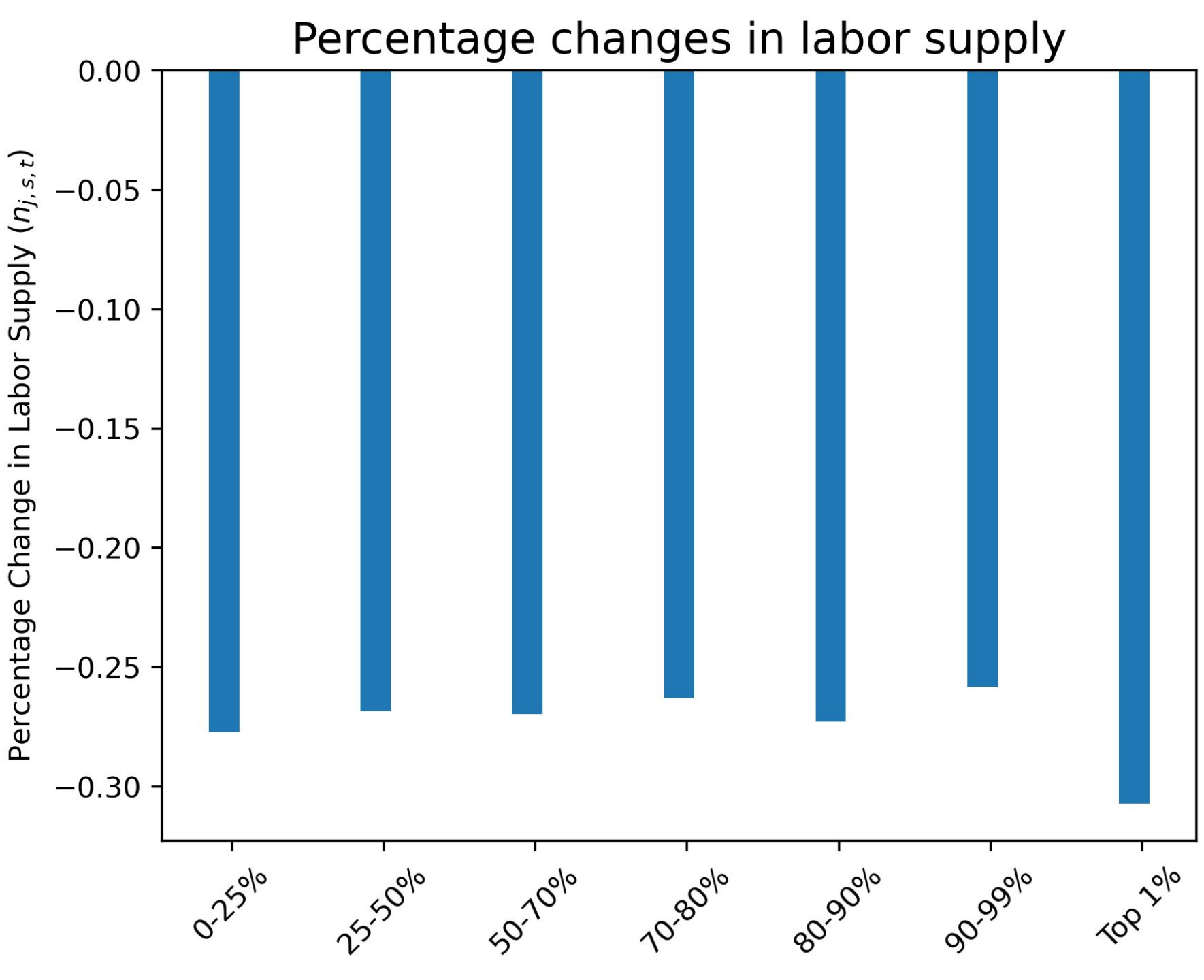


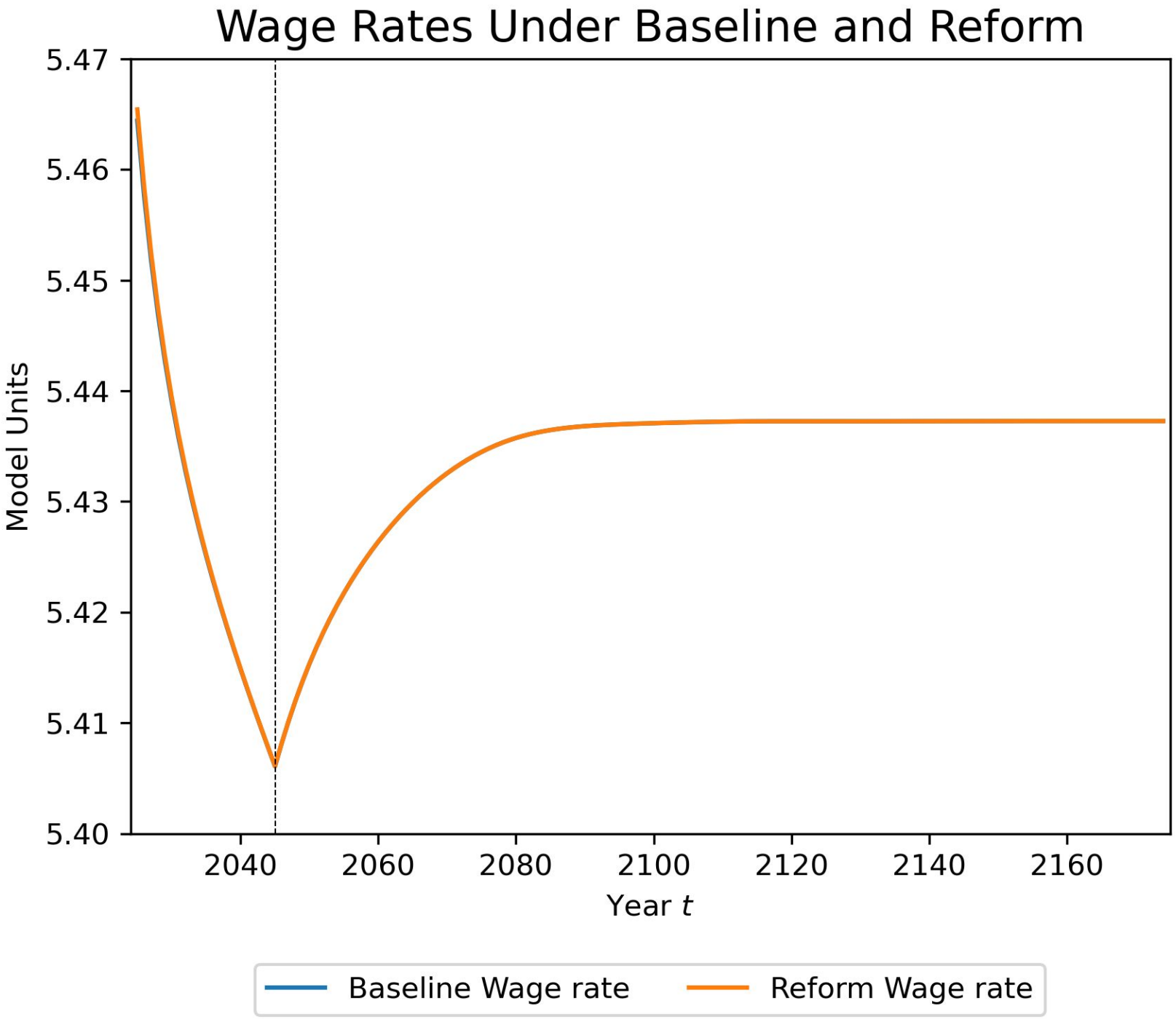


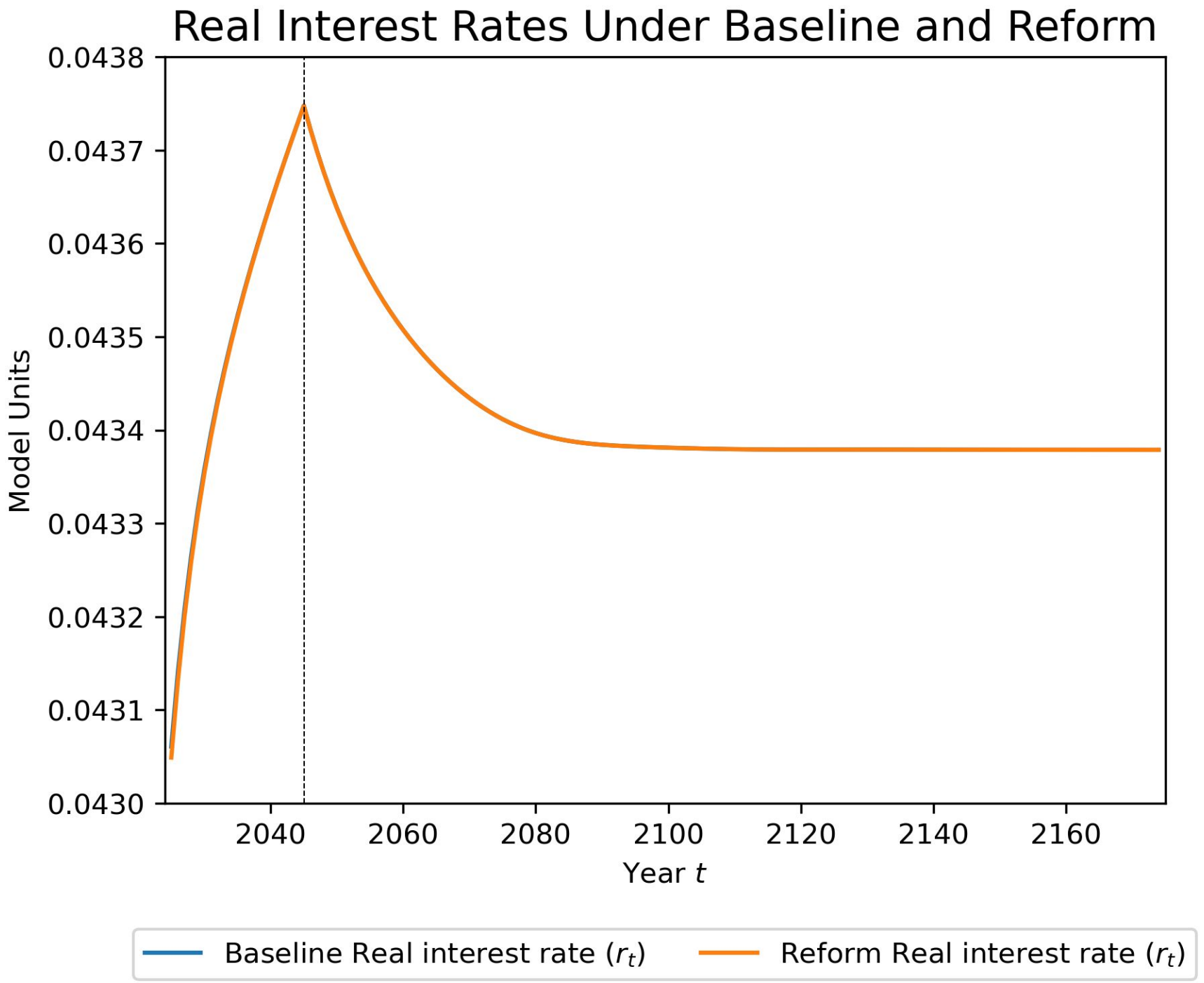


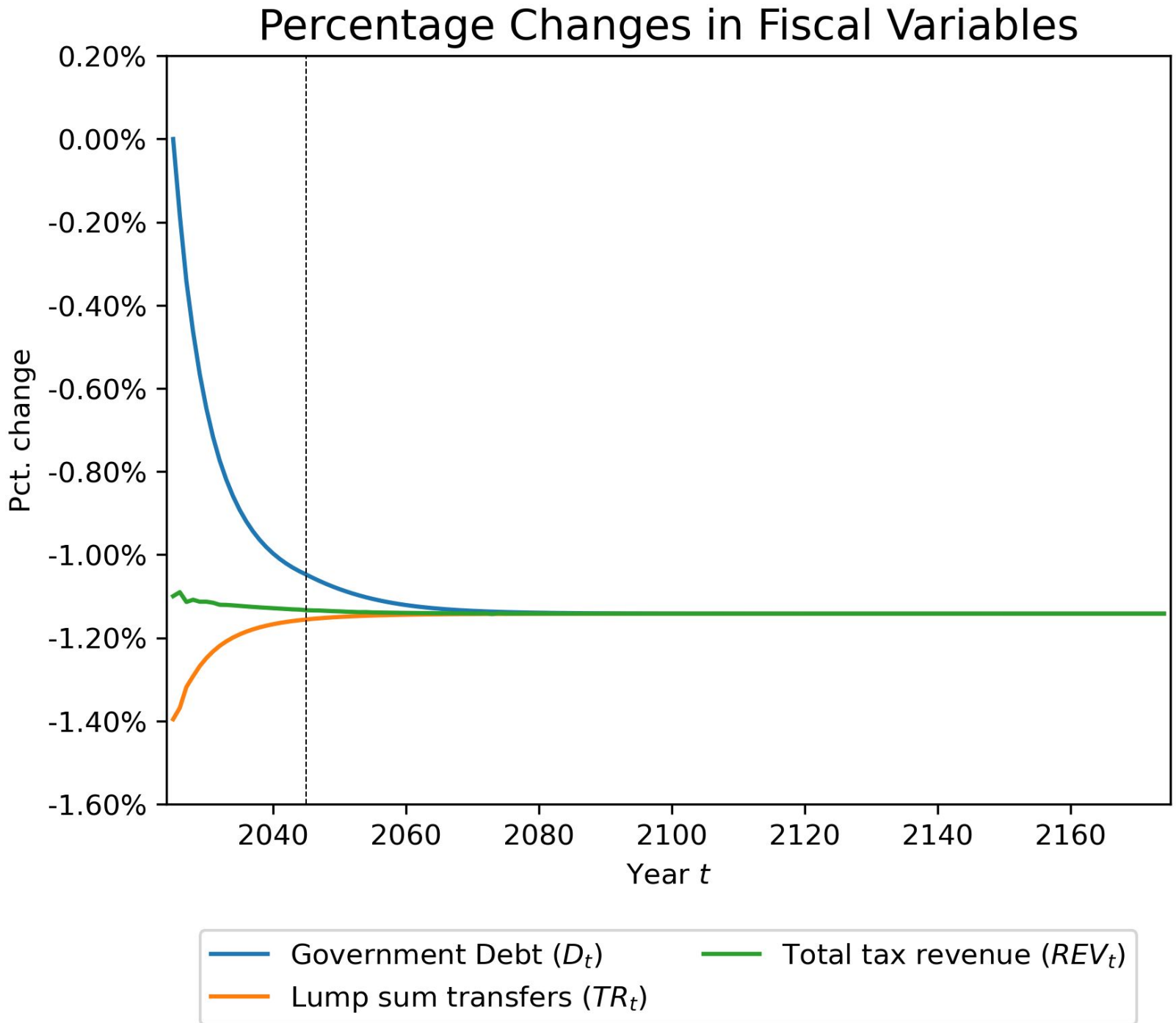

Percentage Changes in Macro Aggregates
-0.70%
-0.80%
-0.90%
-1.00%
-1.10%
-1.20%
-1.30%
-1.40%
-1.50%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
GDP (Y_t)
Capital Stock (K_t)
Labor (L_t)
Consumption (C_t)


Percentage changes in before tax income
Percentage Change in Before tax income
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
0-25%
25-50%
50-70%
70-80%
80-90%
90-99%
Top 1%

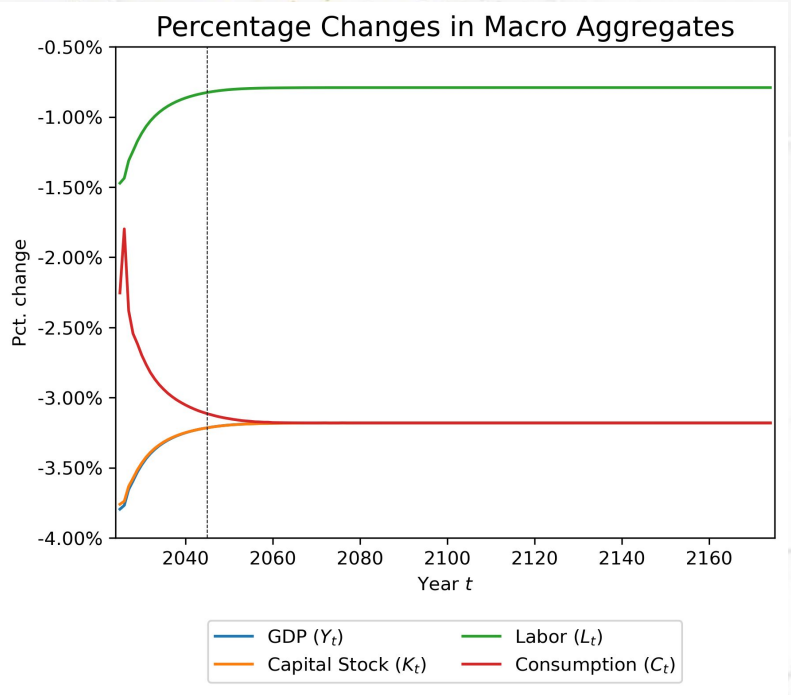

Percentage changes in labor supply
Percentage Change in Labor Supply ($n_{j,s,t}$)
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
−0.30
0-25%
25-50%
50-70%
70-80%
80-90%
90-99%
Top 1%

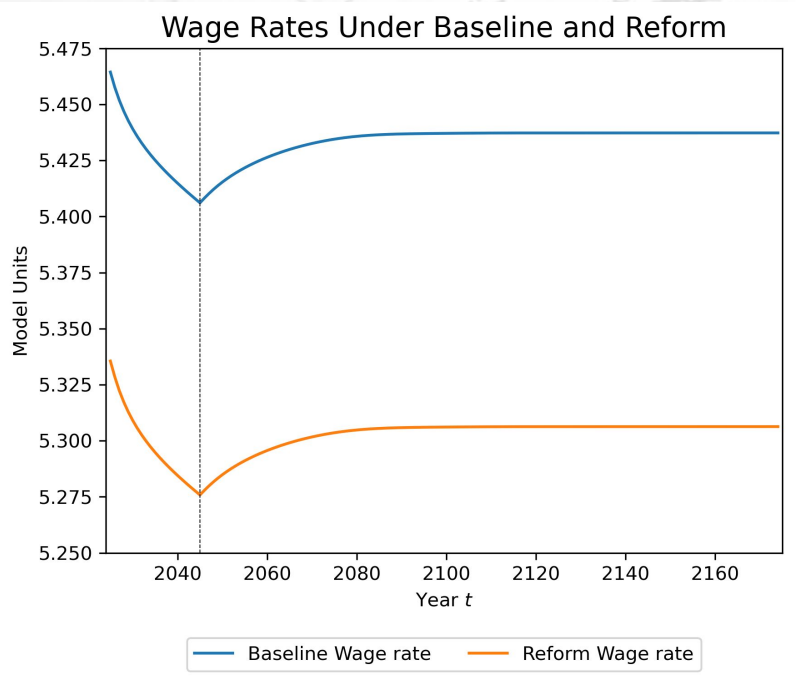

Wage Rates Under Baseline and Reform
5.47
5.46
5.45
5.44
5.43
5.42
5.41
5.40
Model Units
2040
2060
2080
2100
2120
2140
2160
Year t
Baseline Wage rate
Reform Wage rate

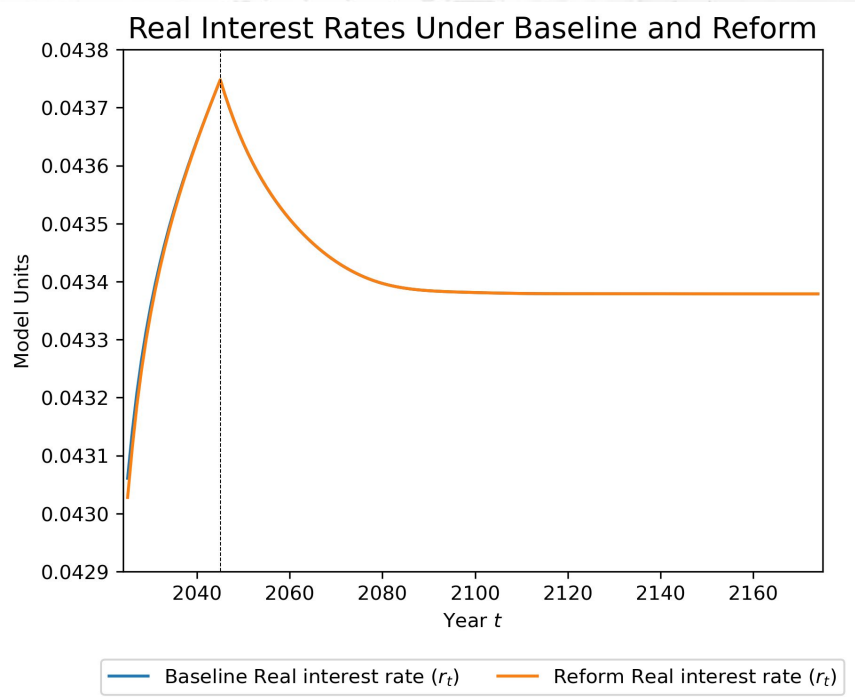

Real Interest Rates Under Baseline and Reform
0.0438
0.0437
0.0436
0.0435
0.0434
0.0433
0.0432
0.0431
0.0430
Model Units
2040
2060
2080
2100
2120
2140
2160
Year t
Baseline Real interest rate (r_t)
Reform Real interest rate (r_t)

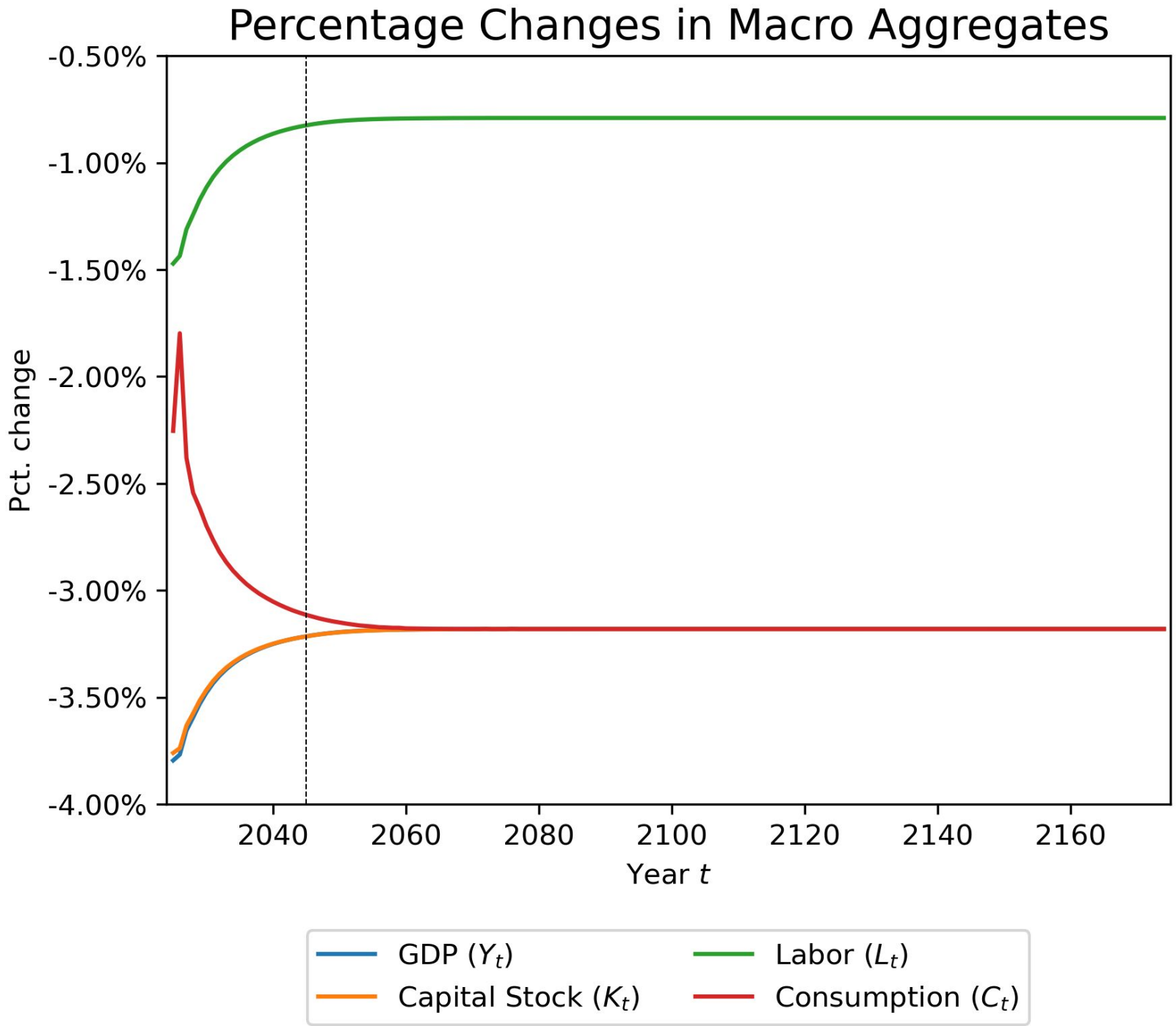

Percentage Changes in Fiscal Variables
0.20%
0.00%
-0.20%
-0.40%
-0.60%
-0.80%
-1.00%
-1.20%
-1.40%
-1.60%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
Government Debt (D_t)
Total tax revenue (REV_t)
Lump sum transfers (TR_t)

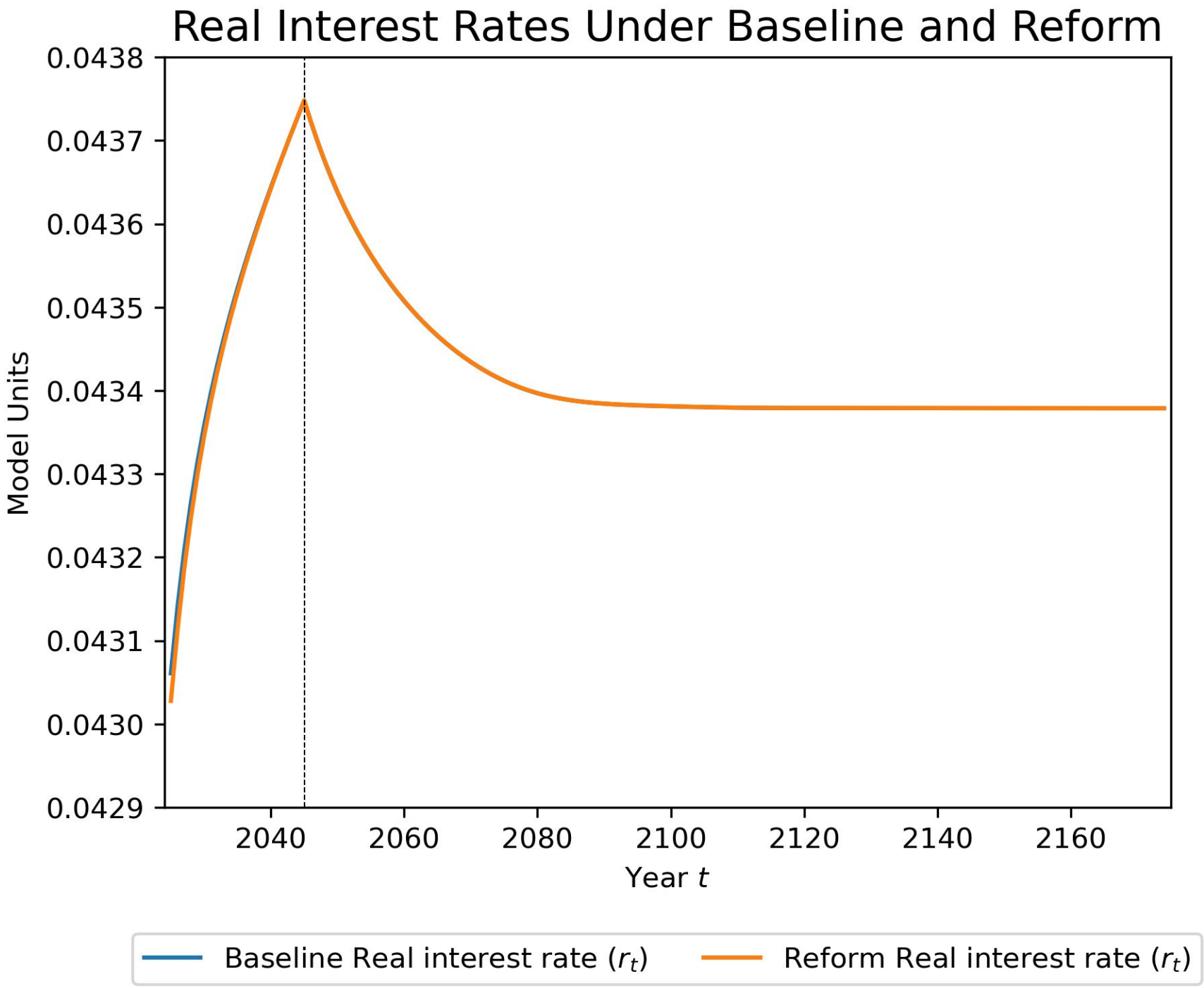
Scenario 3: Wages are lower if TFP declines

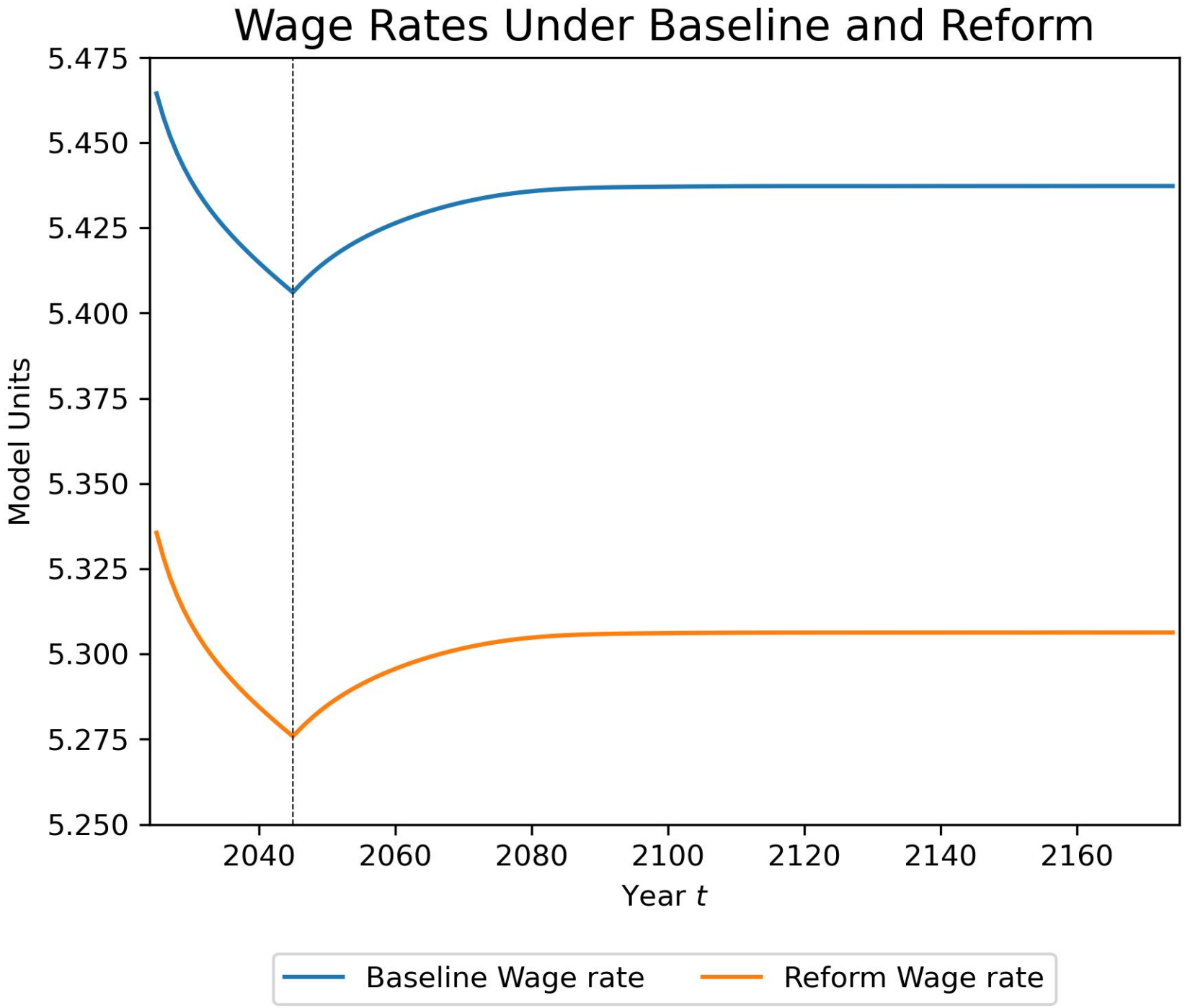


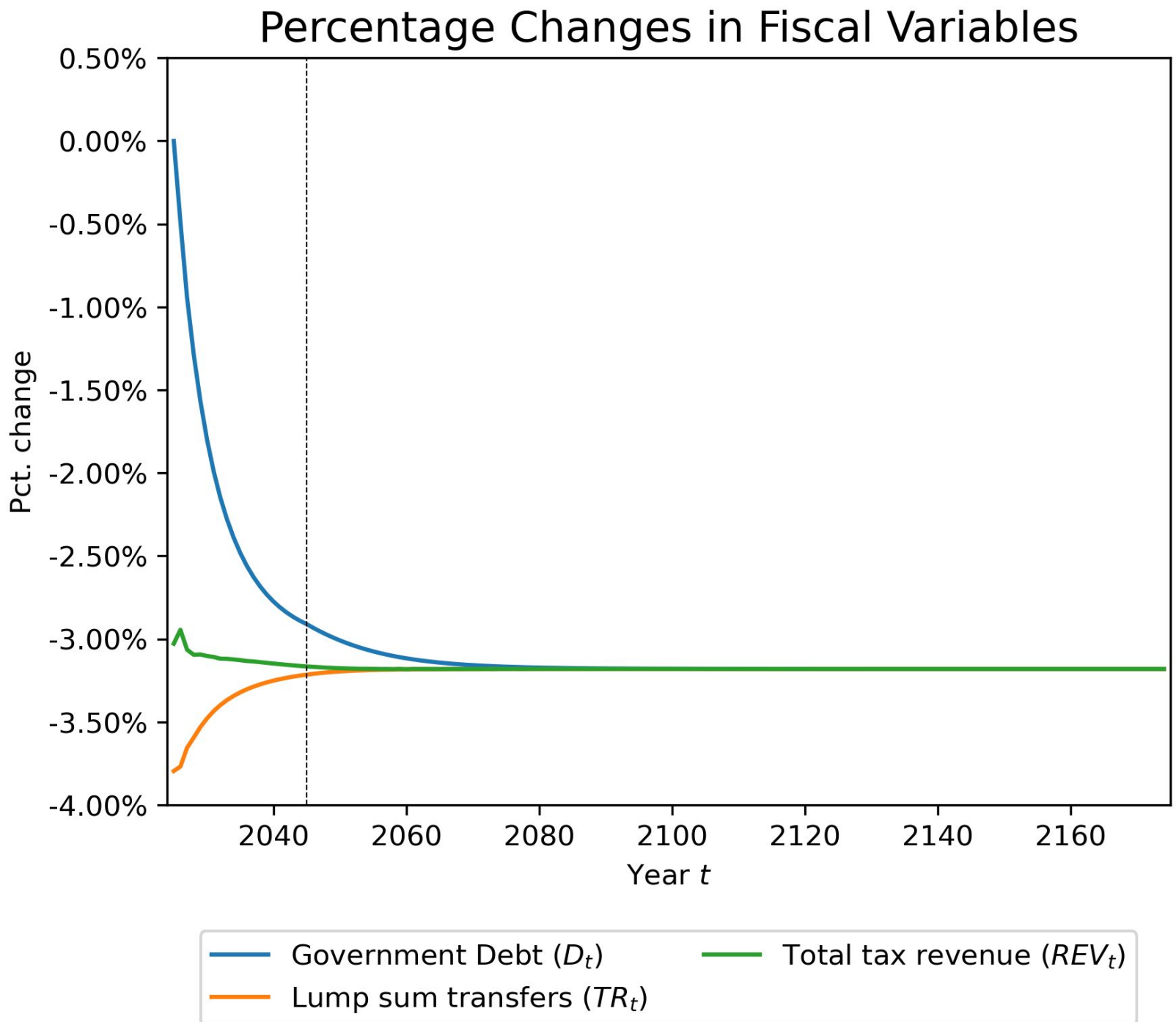




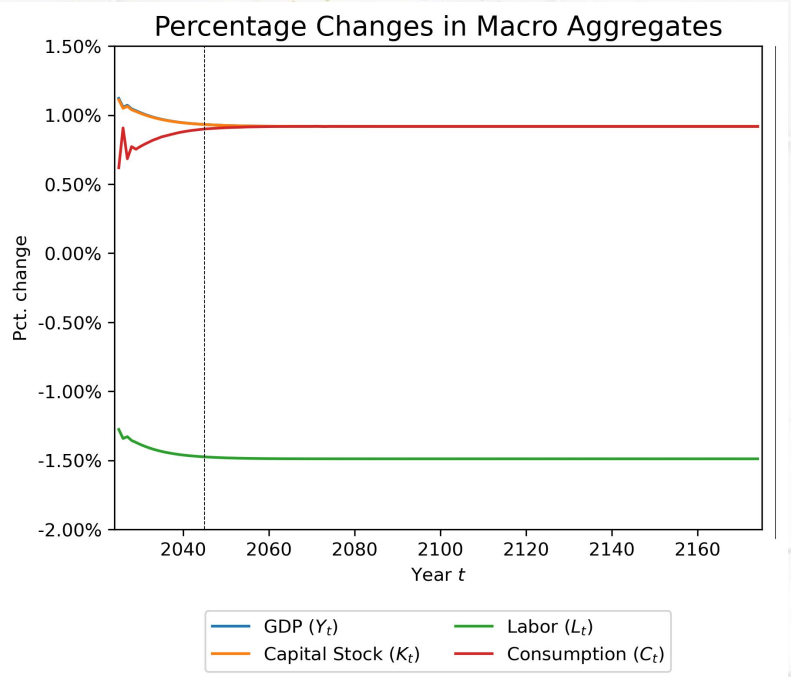

Percentage Changes in Macro Aggregates
-0.50%
-1.00%
-1.50%
-2.00%
-2.50%
-3.00%
-3.50%
-4.00%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
GDP (Y_t)
Capital Stock (K_t)
Labor (L_t)
Consumption (C_t)

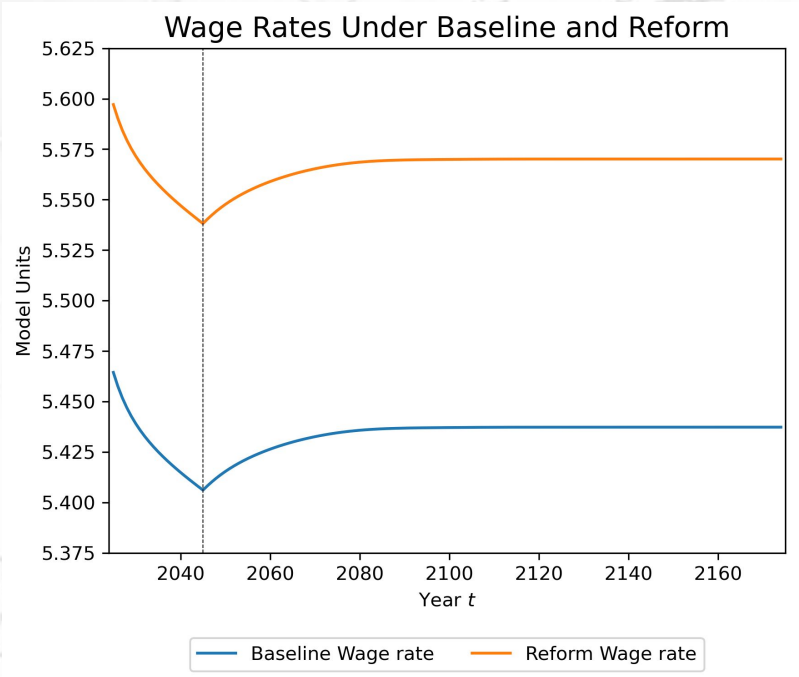

Real Interest Rates Under Baseline and Reform
0.0438
0.0437
0.0436
0.0435
0.0434
0.0433
0.0432
0.0431
0.0430
0.0429
Model Units
2040
2060
2080
2100
2120
2140
2160
Year t
Baseline Real interest rate (r_t)
Reform Real interest rate (r_t)

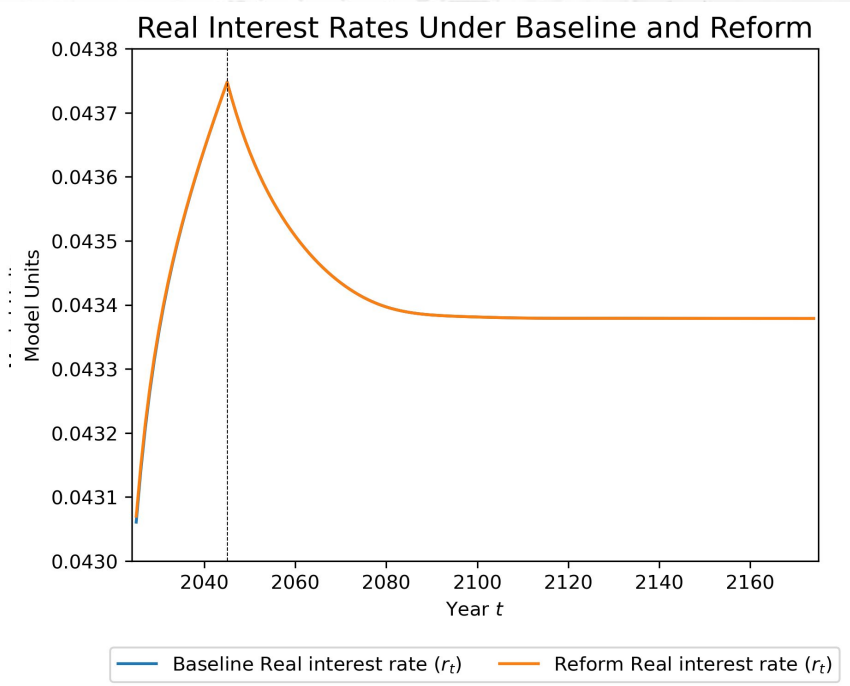

Wage Rates Under Baseline and Reform
5.475
5.450
5.425
5.400
5.375
5.350
5.325
5.300
5.275
5.250
Model Units
2040
2060
2080
2100
2120
2140
2160
Year t
Baseline Wage rate
Reform Wage rate

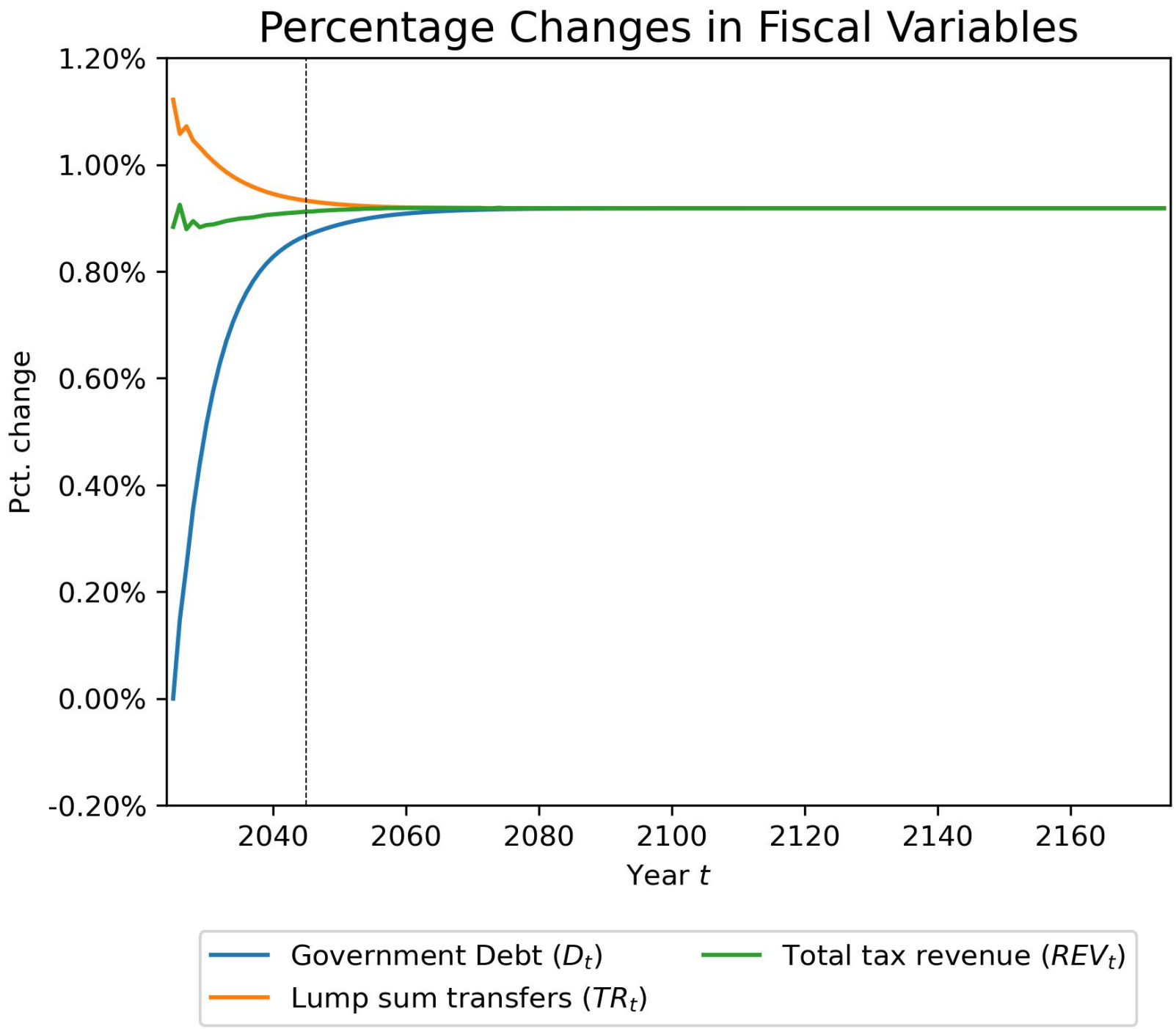

Percentage Changes in Fiscal Variables
0.50%
0.00%
-0.50%
-1.00%
-1.50%
-2.00%
-2.50%
-3.00%
-3.50%
-4.00%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
Government Debt (D_t)
Lump sum transfers (TR_t)
Total tax revenue (REV_t)

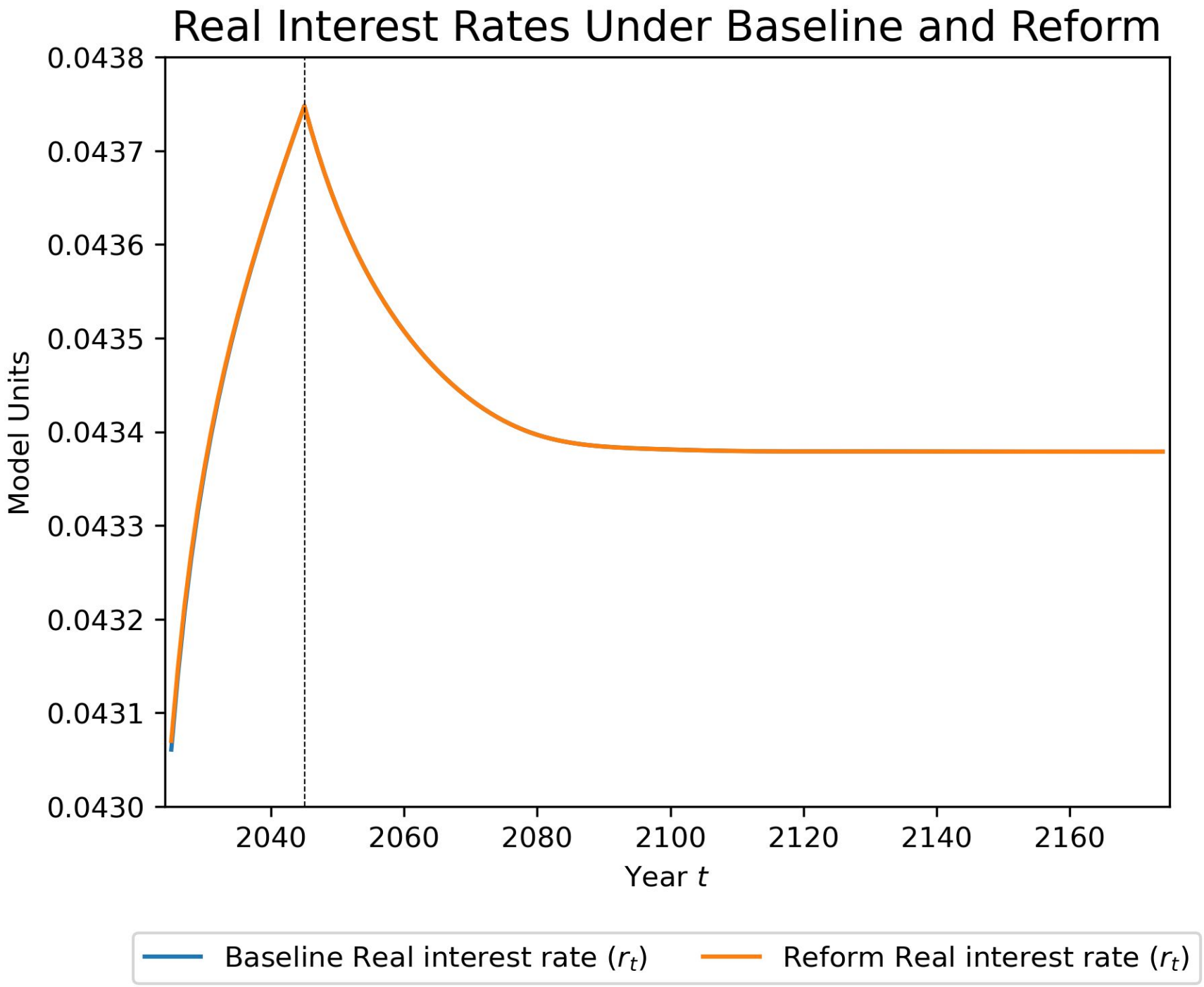
Scenario 4: Building back better raises wages and welfare

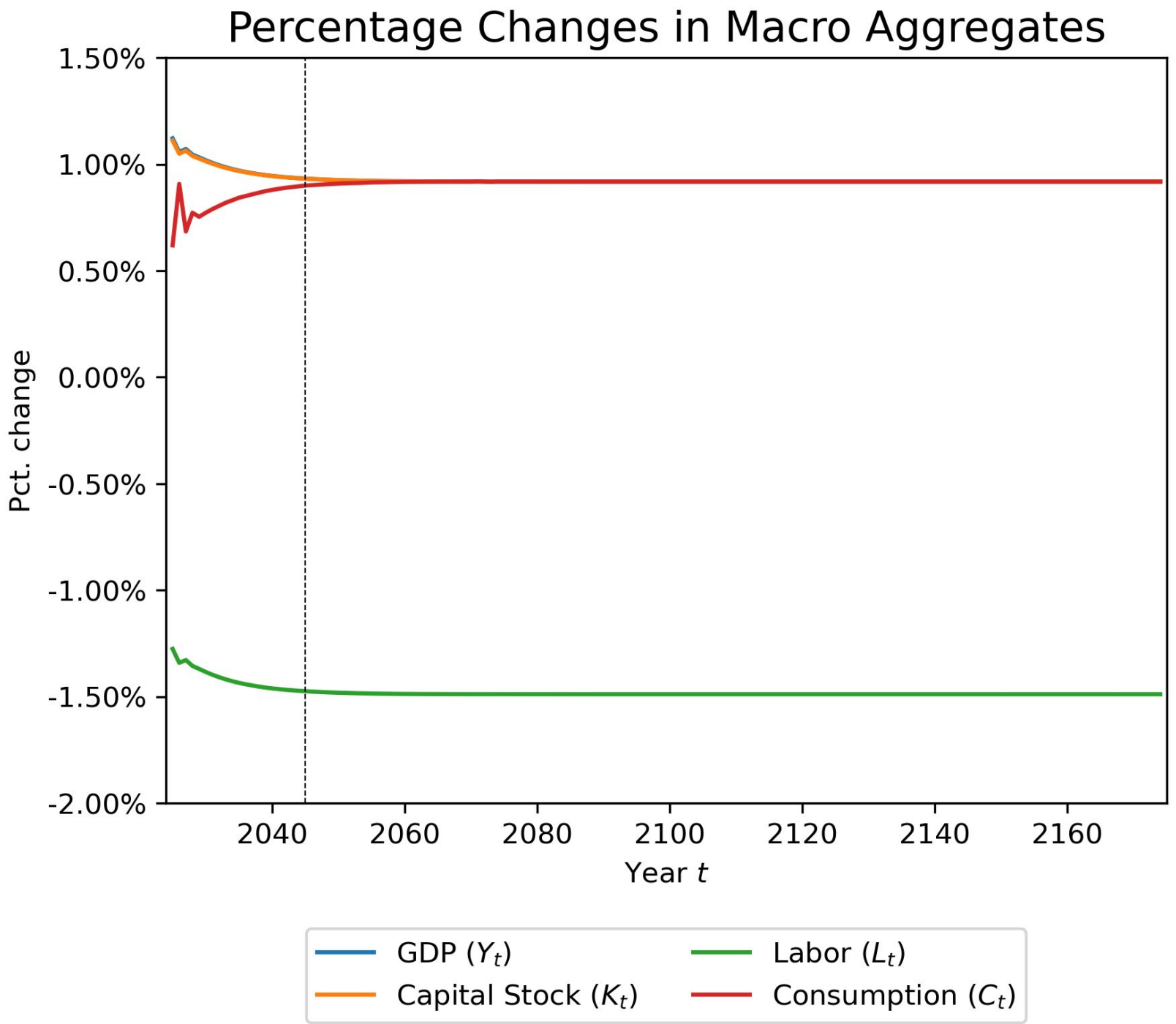


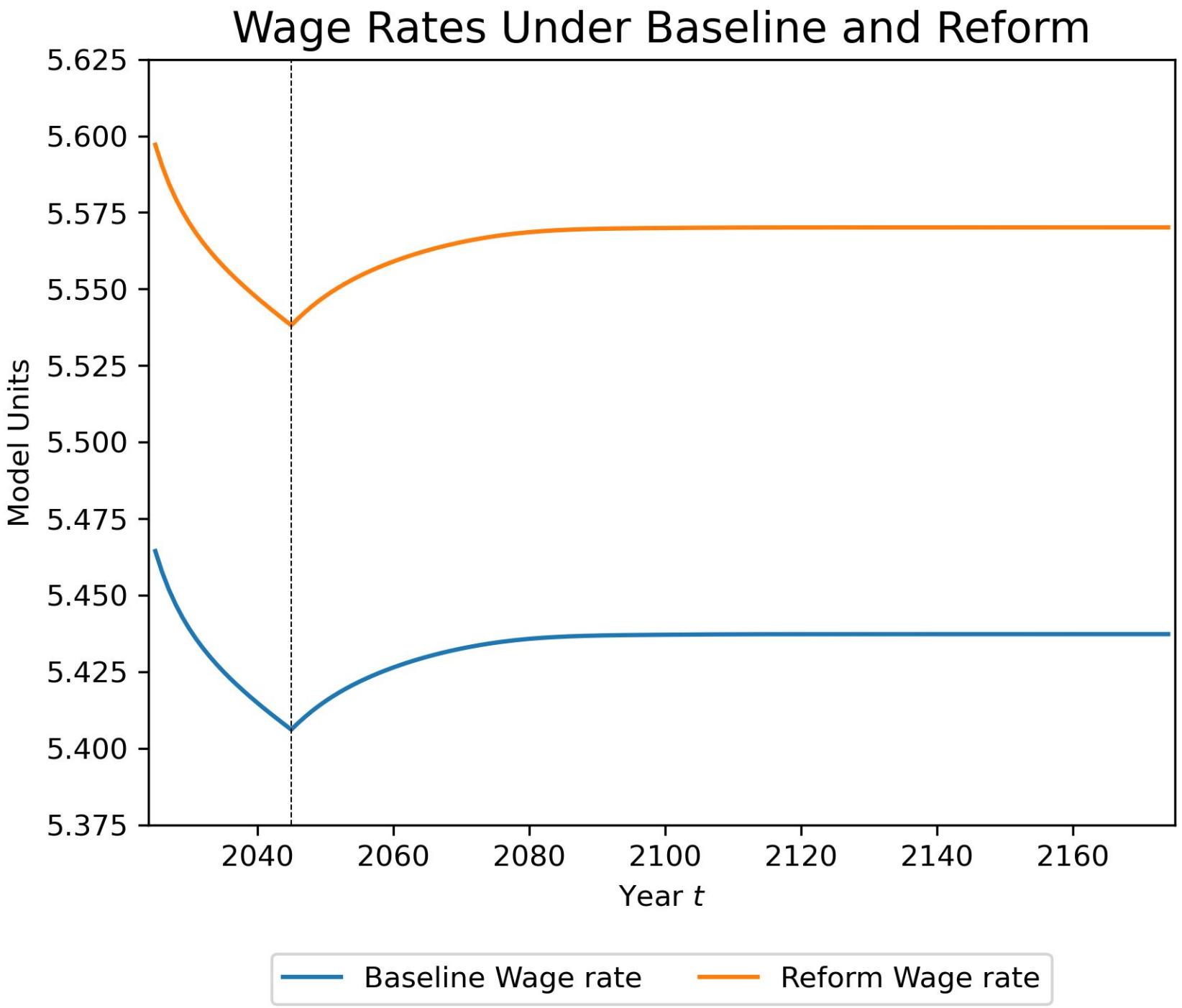





Percentage Changes in Fiscal Variables
1.20%
1.00%
0.80%
0.60%
0.40%
0.20%
0.00%
-0.20%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
Government Debt (D_t)
Lump sum transfers (TR_t)
Total tax revenue (REV_t)


Real Interest Rates Under Baseline and Reform
0.0438
0.0437
0.0436
0.0435
0.0434
0.0433
0.0432
0.0431
0.0430
Model Units
2040
2060
2080
2100
2120
2140
2160
Year t
Baseline Real interest rate (r_t)
Reform Real interest rate (r_t)


Percentage Changes in Macro Aggregates
1.50%
1.00%
0.50%
0.00%
-0.50%
-1.00%
-1.50%
-2.00%
Pct. change
2040
2060
2080
2100
2120
2140
2160
Year t
GDP (Y_t)
Capital Stock (K_t)
Labor (L_t)
Consumption (C_t)


Wage Rates Under Baseline and Reform
5.625
5.600
5.575
5.550
5.525
5.500
5.475
5.450
5.425
5.400
5.375
Model Units
2040
2060
2080
2100
2120
2140
2160
Year t
Baseline Wage rate
Reform Wage rate

Conclusion and ways forward

- Functional forms of the model must be further understood and appreciated to trace the channels of the impacts of disasters.
- A labor and capital supply shock can also be included in the model to simulate deaths and destruction of labor and capital, respectively.
- An exogenous government response after the disaster can be simulated as well.
- Simulation of a temporary shock can also be considered.