

# Dynamic Analysis of EITC Expansion

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Rick is a core maintainer of the [OG-USA](#) open source macroeconomic model for dynamic tax analysis. His research focuses on macroeconomics, fiscal policy, and computational modeling.

**Abstract:** *This Quantitative Note uses the [OG-USA](#) open source dynamic general equilibrium overlapping generations model to perform a dynamic analysis of the Brown-Khanna Grow American Incomes Now (GAIN) Act, which proposes to increase the generosity and scope of the earned income tax credit (EITC) in the United States. I show a simulation of the macroeconomic effects as well as distributional analysis resulting from the GAIN Act. I also simulate the effects of a revenue neutral GAIN Act in which an increase in the marginal income tax rates in the top two personal income brackets exactly offsets the reduction in total federal tax revenue from the EITC expansion. In the case of the GAIN Act alone, the economy experiences short-run gains, but the increased government debt quickly crowds out investment and causes the economy to start shrinking significantly. In the revenue neutral case, the cost is primarily in terms of large labor supply frictions and a reallocation of the household labor-leisure and consumption-savings decisions.*

In September 2017, Senator Sherrod Brown (D-OH) and Representative Ro Khanna (D-CA) introduced legislation for the Grow American Incomes Now (GAIN) Act. The lower panel of Table 1 shows the parameters of the GAIN Act EITC, with the changes from current law highlighted in yellow. The red lines in the panels of Figure 1 show a graphical display of the GAIN Act relative to current law. The GAIN Act roughly

doubles the maximum level of the EITC for all filers. It also increases the EITC to filers with no children, as shown in Figure 1a.

This analysis combines two models in order to simulate the effects of the GAIN act. The first comes from the open source Tax-Calculator microsimulation model of the U.S. economy and tax system. This model simulates the effects of tax changes on federal tax receipts as well as some distributional analysis regarding which parts of the population were effected by the changes.<sup>1</sup>

The primary economic model is the open source OG-USA general equilibrium overlapping generations macroeconomic model of the U.S. economy.<sup>2</sup> OG-USA takes the rich tax data from Tax-Calculator as an input and simulates the behavioral responses to the policy over the lifetimes of households with different incomes as well as the responses of firms. Furthermore, OG-USA also includes the secondary effect of how changing macroeconomic prices affect individual behavior. Generating an estimate of a tax change using a model with macroeconomic feedback is called a dynamic scoring.

I simulate two different tax policy changes. The first analysis is to simulate the effect of the GAIN Act EITC expansion, alone without any other policies. Because this heavily reduces government revenues, we also study a revenue-neutral policy that includes the GAIN Act EITC expansion, but also includes an increase in marginal income tax rates of the top two brackets by 24 percentage points. I increase the tax rates in the top two brackets from 35% and 37%, respectively, to 59% and 63% in order to set the long-run change in steady-state government revenue to zero. The second highest bracket includes total personal income greater than \$200,000 for taxpayers filing singly or includes total income greater than \$400,000 for married taxpayers filing jointly. This tax increase exactly offsets the tax expenditures from the EITC expansion in terms of long-run government revenue change. Table 2 gives a summary of the results from all the analyses.

<sup>1</sup>All the source code for running Tax-Calculator is available in the GitHub repository <https://github.com/open-source-economics/Tax-Calculator>. Documentation on how to use Tax-Calculator is available at <http://open-source-economics.github.io/Tax-Calculator/>. Tax-Calculator can also be used through a web application at <https://www.ospc.org/taxbrain/>.

<sup>2</sup>All the code for the OG-USA model is available at the GitHub repository <https://github.com/open-source-economics/OG-USA>. Documentation on the theory represented by the model is at <https://github.com/open-source-economics/OG-USA/blob/master/documentation/OGUSAdoc.pdf>.

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Figure 1. Current EITC versus GAIN Act EITC as a function of earned income

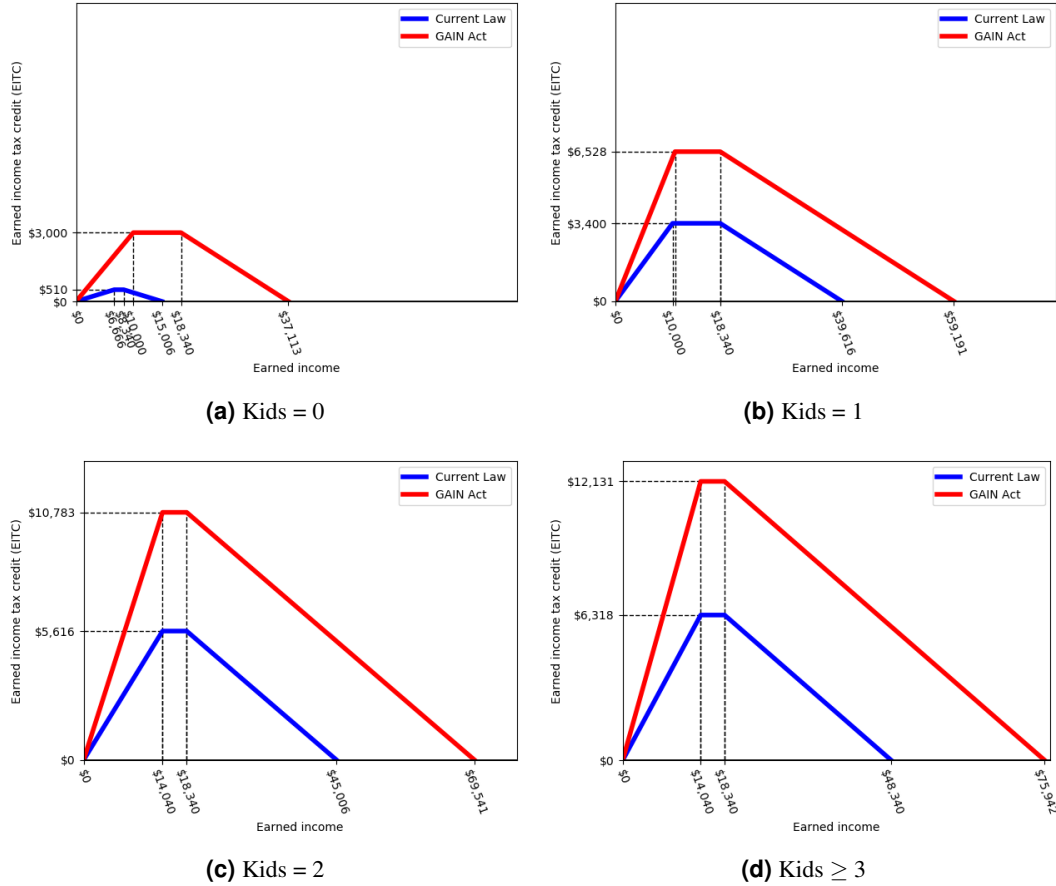


Table 1. EITC parameters: Current law versus GAIN Act

	Current Law				GAIN Act			
	Kids = 0	Kids = 1	Kids = 2	Kids $\geq 3$	Kids = 0	Kids = 1	Kids = 2	Kids $\geq 3$
Maximum EITC	\$510	\$3,400	\$5,616	\$6,318	\$3,000	\$6,528	\$10,783	\$12,131
phase-in rate	0.0765	0.34	0.40	0.45	0.3	0.6258	0.768	0.864
phase-out rate	0.0765	0.1598	0.2106	0.2106	0.1598	0.1598	0.2106	0.2106
phase-out start inc.	\$8,340	\$18,340	\$18,340	\$18,340	\$18,340	\$18,340	\$18,340	\$18,340
	Phase-out start for married filing jointly	Min. age for kids=0 eligible	Max. age for kids=0 eligible	Max. disqual. investment income	Phase-out start for married filing jointly	Min. age for kids=0 eligible	Max. age for kids=0 eligible	Max. disqual. investment income
	\$5,590	25	64	\$3,450	\$5,590	21	64	\$3,450

Note: Colored cells represent proposed changes.

**Table 2. Summary of GAIN Act simulation results**

	<b>GAIN Act alone</b>	<b>Revenue neutral: GAIN Act plus MTR increase</b>
<b>Effect on tax rates</b>	<ul style="list-style-type: none"> <li>• Small reduction in average ETR (-1.0%)</li> <li>• Smaller increase in the average MTR on labor income (+0.75%)</li> </ul>	<ul style="list-style-type: none"> <li>• Small increase in average ETR (+0.20%)</li> <li>• Larger increase in the average MTR on labor income (+3.60%)</li> <li>• Large increase in the average MTR on capital income (+2.85%)</li> </ul>
<b>Effect on labor, employment</b>	<ul style="list-style-type: none"> <li>• Negative effect on the labor supply of the age 20-25 poor</li> <li>• Might have a positive effect on the age 26-40 poor</li> <li>• Overall negative effect on labor supply from increased debt-to-GDP ratio, increased average wage, and decreased interest rate</li> </ul>	<ul style="list-style-type: none"> <li>• Larger decreases in household labor supply, between -1.6% and -2.6%, bigger for old people</li> <li>• Overall effect on total employment is more negative, between -1.60% and -1.85%</li> </ul>
<b>Effect on savings, capital stock</b>	<ul style="list-style-type: none"> <li>• Interest rates decrease initially K/L up (L goes down faster than K)</li> <li>• Savings of the age 21-40 poor increases</li> <li>• Overall savings increases</li> <li>• Large increases in debt-to-GDP ratio crowd out aggregate capital stock. Aggregate capital stock decreases</li> </ul>	<ul style="list-style-type: none"> <li>• Interest rates have large initial decrease between 0.0% and -2.0% in first 5 years</li> <li>• Bigger declines in household savings, -0.2% to -1.4%, biggest among young</li> <li>• Aggregate capital stock decreases by more than in GAIN Act alone scenario</li> </ul>
<b>Effect on macro indicators</b>	<ul style="list-style-type: none"> <li>• GDP declines between -0.4% and -0.65% in the first 5 years</li> <li>• Average wages increase between 0.0% and 0.1% in the first 5 years</li> <li>• Interest rate decreases between 0.0% and -0.4% in the first 5 years</li> </ul>	<ul style="list-style-type: none"> <li>• GDP declines between -1.0% and -1.7% in the first 5 years, more than GAIN Act alone</li> <li>• Average wages increase between 0.0% and 0.6% in the first 5 years</li> <li>• Interest rate decreases between 0.0% and -2.0% in the first 5 years, bigger than GAIN Act alone</li> </ul>
<b>Effect on fiscal indicators</b>	<ul style="list-style-type: none"> <li>• Government revenues decline between -6.8% and -8.0%</li> <li>• Debt-to-GDP ratio increases by 4 percentage points after 5 years and by 20 percentage points after 20 years</li> <li>• Requires a decrease of government non-transfer spending as a percent of GDP of between -2 percentage points and -3 percentage points in 20 years to stabilize the debt-to-GDP ratio at 100%</li> </ul>	<ul style="list-style-type: none"> <li>• Government non-transfer spending as a percent of GDP ranges between -3 percentage points to +2 percentage points relative to the baseline in first 10 years, then neutral thereafter</li> <li>• Debt-to-GDP ratio actually decreases in the first 20 years</li> </ul>

## 1. EITC Background

The Earned Income Tax Credit (EITC) was originally established in the U.S. tax code as part of the Tax Reduction Act of 1975.<sup>3</sup> Since its enactment, the EITC has been amended multiple times, most recently by the Protecting Americans from Tax Hikes Act of 2015.<sup>4</sup> The solid blue lines in each of the panels of Figure 1 show the size of the EITC as a function of earned income of the filer (excluding capital income).

The EITC phases in over low income ranges, hits a maximum tax credit over the next range of income, and then gradually phases out to zero for higher incomes. The phase-in rates, phase-out rates, and maximum tax credit levels become more generous as tax filers have more children. Figure 1 shows the EITC schedule for filers with 0, 1, 2, and 3-or-more children, respectively. The gradual phase in and phase out are designed to reduce the behavioral distortions of the EITC as much as possible.<sup>5</sup> Under current law, the minimum age for EITC eligibility is 25, and the maximum age is 64. A filer is also disqualified from EITC eligibility more than \$3,450 in investment income is reported. The top panel of Table 1 shows the parameters of the current law EITC.

## 2. GAIN Act Alone

In the first set of simulations, I model the effect of the GAIN Act EITC expansion with no other policy changes. Table 3 reports the Tax-Calculator microsimulation model results of this policy change. The EITC expansion decreases average effective tax rates by less than one percentage point on average over the first five years, but it results in a slight increase in average marginal tax rates on labor income. This increase in average marginal tax rates is due to the enlarged plateau region for filers with no children (Figure 1a) and the elongated phase-out ranges of the expanded EITC shown in each panel of Figure 1.

Figure 2a and 2b show the average percent change in household labor supply by age and by lifetime income percentile in response to the policy over the first five years for closed economy and small open economy simulations, respectively.<sup>6</sup>

<sup>3</sup>The Tax Reduction Act was H.R. 2166 and was signed into law by President Gerald Ford on March 29, 1975. Summary and detail of the bill is presented at <https://www.congress.gov/bill/94th-congress/house-bill/2166>.

<sup>4</sup>The Protecting Americans from Tax Hikes Act of 2015 made some provisions of the EITC permanent that were set to expire in 2017.

<sup>5</sup>Athreya et al. (2010), Eissa and Hoynes (2011, 2004), Eissa and Liebman (1996), and Meyer (2002), provide good introductions to the theory. Dickert et al. (1995), Eissa and Liebman (1996), Meyer and Rosenbaum (2001) showing that single filers and primary earners in married couples increase labor supply with the phase-in, but EITC has little effect on hours once employed. Meyer (2002) finds no effect of a reduction of hours with the phase-out.

<sup>6</sup>Lifetime income groups are a dimension of heterogeneity among the OG-USA households by lifetime earning potential. This is similar to the concept of innate ability or productivity. OG-USA uses IRS data to estimate lifetime income and divides the population into the seven lifetime income

Due to macroeconomic reasons to be discussed below, labor supply decreases in both the closed and open economy cases for all households. However, both panels seem to indicate that the expanded EITC has an extra negative impact on the labor supply of the youngest poor (ages 21-25, solid line). This effect likely comes from the reduction of the minimum EITC eligibility age to 21 for filers with no children. It is also worth noting that the labor supply of filers older than age 50 decreases most dramatically in the closed economy case (Figure 2a).

The effect of the GAIN Act on household savings is unambiguously positive, although small. However, there seems to be an extra increase in savings for poorer filers ages 21-40 as well as a less pronounced but broader increase across the entire income spectrum between ages 21 to 55.

With labor supply universally decreasing (Figures 2a and 2b) and household consumption unambiguously increasing (Figures 2e and 2f) it is clear that the GAIN Act alone provides an increase in household welfare for the first 5 years. However, the following longer-run analysis of macroeconomic variables shows that this effect must be temporary.

Figure 3 shows the percentage changes in the macroeconomic variables of the model over the entire equilibrium transition path. Tables 4 and 5 show the first 10 years of percentage change values from Figure 3 as well as the 10-year average percent change and long-run steady-state percent change.

The GAIN Act causes an initial increase in average wages followed by a 15-year decline. It causes an initial decrease in the interest rate followed by a 15-year increase. And GDP declines a modest -0.4% to -0.6% in the first five years. The debt-to-GDP ratio is about 7.5 percentage points higher than the baseline after 10 years and government revenue as a percent of GDP is an average of 6 percentage points lower than the baseline from 2019 to 2028. This policy would require a permanent cut in government non-transfer spending as a percent of GDP between 2.0 and 3.5 percentage points in 20 years (2038) to stabilize the debt-to-GDP ratio at 100%.

Due to the steep increase in the debt-to-GDP ratio, small increase in average wages, and small decrease in average wages, total U.S. employment declines by 0.5% in the first 5 years. Because the debt-to-GDP ratio is rising due to the increased tax expenditures, capital investment is crowded out, the aggregate capital stock falls, and the interest rate rises.

## 3. Revenue Neutral: GAIN Act plus MTR increase

In the second set of simulations, I model the effect of the GAIN Act EITC expansion with a tax increase that renders

percentiles shown in the legend of Figures 2 and 4. See DeBacker and Evans (2017, Chap. 4).

**Table 3. Change in average effective and average marginal tax rates from GAIN Act alone**

Tax rate	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
<i>ETR</i> baseline <sup>b</sup>	21.45%	20.15%	20.19%	20.19%	20.21%	20.23%	20.29%	20.34%	20.39%	21.72%
<i>ETR</i> reform	21.42%	19.10%	19.20%	19.25%	19.32%	19.40%	19.51%	19.62%	19.73%	21.16%
<i>ETR</i> diff. <sup>a</sup>	-0.03%	-1.05%	-0.99%	-0.94%	-0.89%	-0.83%	-0.78%	-0.72%	-0.66%	-0.55%
<i>MTRx</i> baseline <sup>c</sup>	31.97%	28.55%	28.54%	28.53%	28.51%	28.53%	28.54%	28.56%	28.60%	31.82%
<i>MTRx</i> reform	32.17%	29.18%	29.25%	29.30%	29.33%	29.41%	29.49%	29.55%	29.66%	33.08%
<i>MTRx</i> diff. <sup>a</sup>	0.20%	0.63%	0.71%	0.77%	0.82%	0.88%	0.94%	0.99%	1.06%	1.27%

<sup>a</sup> The tax rate difference row is the simple difference of the reform minus the baseline. These difference values are, therefore, percentage point differences and not percentage differences.

<sup>b</sup> *ETR* is the average effective tax rate in each year across all filers. For each filer, *ETR* total tax liability *T* divided by unadjusted gross income  $T/(rb + wn)$

<sup>c</sup> *MTRx* is the average marginal tax rate on labor income in each year across all filers. For each filer, *MTRx* is the derivative of an filer's total tax liability *T* with respect to labor income  $x \equiv w \times n$ .

**Table 4. Time path and steady-state percent changes for macroeconomic variables from GAIN Act alone, closed economy**

Macro var. <sup>a</sup>	Year										Avg. 10-yr	Steady state
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
$Y_t$	-0.15%	-0.36%	-0.46%	-0.56%	-0.65%	-0.74%	-0.83%	-0.93%	-1.03%	-1.21%	-0.69%	-0.65%
$C_t$	0.19%	0.20%	0.18%	0.16%	0.13%	0.09%	0.05%	0.01%	-0.03%	-0.08%	0.09%	-0.10%
$I_t$	-1.11%	-1.88%	-2.24%	-2.59%	-2.88%	-3.17%	-3.52%	-3.82%	-4.16%	-4.97%	-3.03%	-0.34%
$K_t$	0.03%	-0.07%	-0.23%	-0.41%	-0.59%	-0.78%	-0.98%	-1.18%	-1.39%	-1.60%	-0.72%	-0.34%
$L_t$	-0.25%	-0.52%	-0.59%	-0.64%	-0.68%	-0.72%	-0.76%	-0.79%	-0.83%	-1.00%	-0.68%	-0.82%
$w_t$	0.10%	0.16%	0.13%	0.08%	0.03%	-0.02%	-0.08%	-0.14%	-0.20%	-0.21%	-0.02%	0.17%
$r_t$	-0.30%	-0.49%	-0.39%	-0.25%	-0.09%	0.07%	0.25%	0.44%	0.62%	0.67%	0.05%	-0.56%
$Rev_t$	-0.30%	-7.69%	-7.35%	-7.05%	-6.74%	-6.37%	-5.98%	-5.58%	-5.15%	-4.21%	-5.64%	-5.04%
$D_t/Y_t$ <sup>b</sup>	0.00%	0.13%	1.09%	2.02%	2.93%	3.84%	4.74%	5.63%	6.52%	7.57%	3.45%	0.00%
$G_t/Y_t$ <sup>b</sup>	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.50%

<sup>a</sup> The macroeconomic variables in the table are GDP ( $Y_t$ ), aggregate consumption ( $C_t$ ), aggregate investment ( $I_t$ ), aggregate capital stock ( $K_t$ ), aggregate labor ( $L_t$ ), average wage ( $w_t$ ), interest rate or rate of return on savings ( $r_t$ ), government revenue ( $Rev_t$ ), government debt ( $D_t$ ), government spending on public goods ( $G_t$ ), debt-to-GDP ratio ( $D_t/Y_t$ ), and government spending as a percent of GDP ( $G_t/Y_t$ ).

<sup>b</sup> The changes in debt-to-GDP ratio ( $D_t/Y_t$ ) and government spending as a percent of GDP ( $G_t/Y_t$ ) are reported as percentage point differences (simple differences) rather than percent changes to avoid zeros in the denominator.

the policy revenue neutral such that the long-run change in government revenues from the baseline scenario is zero. We limit ourself to proportional increases in the statutory marginal tax rates in the top two personal income tax brackets. The required change is an increase in marginal income tax rates of the top two brackets by 24 percentage points—from 35% and 37%, respectively, to 59% and 63%. The second highest bracket includes total personal income greater than \$200,000 for taxpayers filing singly or includes total income greater than \$400,000 for married taxpayers filing jointly. This tax increase exactly offsets the tax expenditures from the EITC expansion.

Table 6 reports the Tax-Calculator microsimulation model results of this policy change. This revenue neutral policy change causes a small increase in average effective tax rates, in which the increase in marginal tax rates on high personal income more than offsets the tax cut. It also generates an increase in the average marginal tax rates on labor income (+3.6 percentage points) and capital income (+2.8 percentage points), respectively. Figures 4a and 4b show this policy has a

larger negative impact on the labor supply of the young ages 21-40 (-1.5% to -1.6%) and an even greater decline for older workers. Total U.S. employment declines by -1.7% in the first 5 years.

Figure 4a and 4b show the average percent change in household labor supply by age and by lifetime income percentile in response to the policy over the first five years for closed economy and small open economy simulations, respectively. Due to macroeconomic reasons to be discussed below, labor supply decreases in both the closed and open economy cases for all households. However, both panels seem to indicate that the expanded EITC has an extra negative impact on the labor supply of the youngest poor (ages 21-25, solid line). It is also worth noting that the labor supply of filers older than age 50 decreases most dramatically in the closed economy case (Figure 4a).

The effect of the revenue neutral GAIN Act on household savings is unambiguously negative for all filers of all ages and all lifetime income groups. This effect has the opposite sign of the GAIN Act alone. However, the declines in savings are



**Table 5. Time path and steady-state percent changes for macroeconomic variables from GAIN Act alone, small open economy**

Macro var. <sup>a</sup>	Year										Avg. 10-yr	Steady state
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
$Y_t$	-0.25%	-0.57%	-0.63%	-0.68%	-0.70%	-0.73%	-0.75%	-0.77%	-0.79%	-0.97%	-0.68%	-0.84%
$C_t$	0.12%	0.15%	0.15%	0.15%	0.13%	0.11%	0.09%	0.06%	0.03%	-0.01%	0.10%	-0.17%
$I_t$	-3.28%	-1.32%	-1.13%	-1.00%	-1.02%	-1.03%	-0.92%	-1.08%	-3.54%	-0.73%	-1.51%	-0.84%
$K_t$	-0.25%	-0.57%	-0.63%	-0.68%	-0.70%	-0.73%	-0.75%	-0.77%	-0.79%	-0.97%	-0.68%	-0.84%
$L_t$	-0.25%	-0.57%	-0.63%	-0.68%	-0.70%	-0.73%	-0.75%	-0.77%	-0.79%	-0.97%	-0.68%	-0.84%
$w_t$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
$r_t$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
$Rev_t$	-0.30%	-8.21%	-7.92%	-7.66%	-7.39%	-7.07%	-6.72%	-6.35%	-5.97%	-5.01%	-6.26%	-5.22%
$D_t/Y_t^b$	0.00%	0.20%	0.99%	1.74%	2.44%	3.12%	3.76%	4.35%	4.92%	5.73%	2.72%	-0.00%
$G_t/Y_t^b$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.00%	0.00%	-0.44%

<sup>a</sup> The macroeconomic variables in the table are GDP ( $Y_t$ ), aggregate consumption ( $C_t$ ), aggregate investment ( $I_t$ ), aggregate capital stock ( $K_t$ ), aggregate labor ( $L_t$ ), average wage ( $w_t$ ), interest rate or rate of return on savings ( $r_t$ ), government revenue ( $Rev_t$ ), government debt ( $D_t$ ), government spending on public goods ( $G_t$ ), debt-to-GDP ratio ( $D_t/Y_t$ ), and government spending as a percent of GDP ( $G_t/Y_t$ ).

<sup>b</sup> The changes in debt-to-GDP ratio ( $D_t/Y_t$ ) and government spending as a percent of GDP ( $G_t/Y_t$ ) are reported as percentage point differences (simple differences) rather than percent changes to avoid zeros in the denominator.

**Table 6. Change in average effective and marginal tax rates from GAIN Act plus MTR increase**

Tax rate	Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
<i>ETR</i> baseline	21.45%	20.15%	20.19%	20.19%	20.21%	20.23%	20.29%	20.34%	20.39%	21.72%
<i>ETR</i> reform	21.18%	20.27%	20.38%	20.44%	20.52%	20.61%	20.73%	20.85%	20.97%	22.03%
<i>ETR</i> diff. <sup>a</sup>	-0.27%	0.12%	0.19%	0.25%	0.31%	0.38%	0.45%	0.51%	0.58%	0.31%
<i>MTRx</i> baseline	31.97%	28.55%	28.54%	28.53%	28.51%	28.53%	28.54%	28.56%	28.60%	31.82%
<i>MTRx</i> reform	34.87%	31.98%	32.08%	32.14%	32.21%	32.30%	32.41%	32.51%	32.64%	35.53%
<i>MTRx</i> diff. <sup>a</sup>	2.91%	3.43%	3.54%	3.61%	3.70%	3.78%	3.86%	3.95%	4.05%	3.71%
<i>MTRy</i> baseline	34.16%	29.48%	29.50%	29.47%	29.44%	29.52%	29.61%	29.70%	29.87%	34.33%
<i>MTRy</i> reform	36.28%	32.25%	32.33%	32.33%	32.36%	32.47%	32.59%	32.73%	32.93%	36.86%
<i>MTRy</i> diff. <sup>a</sup>	2.12%	2.77%	2.83%	2.86%	2.91%	2.95%	2.98%	3.02%	3.06%	2.53%

<sup>a</sup> The tax rate difference row is the simple difference of the reform minus the baseline. These difference values are, therefore, percentage point differences and not percentage differences.

<sup>b</sup> *ETR* is the average effective tax rate in each year across all filers. For each filer, *ETR* total tax liability  $T$  divided by unadjusted gross income  $T/(rb + wn)$ .

<sup>c</sup> *MTRx* is the average marginal tax rate on labor income in each year across all filers. For each filer, *MTRx* is the derivative of an filer's total tax liability  $T$  with respect to labor income  $x \equiv w \times n$ .

<sup>d</sup> *MTRy* is the average marginal tax rate on capital income in each year across all filers. For each filer, *MTRy* is the derivative of an filer's total tax liability  $T$  with respect to capital income  $y \equiv r \times b$ .

most pronounced among younger filers. This policy causes interest rates to have a large initial decrease between 0.0% and 2.0% in the first 5 years. And the aggregate capital stock decreases by more than in the GAIN Act alone scenario.

The revenue neutral GAIN Act causes an initial increase in average wages between 0.0% and 0.6% over the first 10 years followed declines in average wages over the next 10 years. It causes an initial decrease in the interest rate between 0.0% and -2.0% followed by increases in interest rates over the next 10 years. And GDP declines a larger -1.0% to -1.7% in the first five years—more than the GAIN Act expansion alone. In this scenario, government revenues as a percent of GDP start 3.6 percentage points below the baseline and then rise over the next 10 years to almost 2 percentage points above the baseline. Government revenues as a percent of GDP are

virtually equal to the baseline after 2028. The debt-to-GDP ratio actually decreases relative to the baseline in the first 20 years. And only small increases in government spending in 2038 are required to stabilize the debt-to-GDP ratio.

## 4. Summary

Table 2 presents a summary of the results of these simulations for the GAIN Act alone case and for the case of the revenue neutral GAIN Act which includes the increased marginal tax rates on the top two brackets. The expanded EITC of the GAIN Act reduces labor supply in all cases. It may provide short-run welfare gains as well as some long-run redistributive welfare improvements after fiscal adjustment.

**Table 7. Time path and steady-state percent changes for macroeconomic variables from GAIN Act plus MTR increase, closed economy**

Macro var. <sup>a</sup>	Year										Avg. 10-yr	Steady state
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
$Y_t$	-1.05%	-1.26%	-1.36%	-1.45%	-1.52%	-1.59%	-1.65%	-1.70%	-1.76%	-1.72%	-1.51%	-2.08%
$C_t$	-0.19%	-0.40%	-0.58%	-0.74%	-0.89%	-1.03%	-1.15%	-1.27%	-1.37%	-1.42%	-0.90%	-1.98%
$I_t$	-3.48%	-3.60%	-3.52%	-3.44%	-3.33%	-3.23%	-3.16%	-3.07%	-3.01%	-2.72%	-3.26%	-3.00%
$K_t$	0.22%	-0.10%	-0.41%	-0.69%	-0.92%	-1.13%	-1.30%	-1.45%	-1.58%	-1.69%	-0.91%	-2.98%
$L_t$	-1.73%	-1.88%	-1.87%	-1.85%	-1.84%	-1.84%	-1.84%	-1.84%	-1.86%	-1.74%	-1.83%	-1.59%
$w_t$	0.69%	0.63%	0.52%	0.41%	0.33%	0.25%	0.19%	0.14%	0.10%	0.02%	0.33%	-0.50%
$r_t$	-2.12%	-1.92%	-1.58%	-1.27%	-1.01%	-0.78%	-0.59%	-0.43%	-0.31%	-0.05%	-1.01%	1.65%
$Rev_t$	-3.66%	-1.39%	-0.95%	-0.55%	-0.16%	0.28%	0.72%	1.16%	1.59%	-0.37%	-0.33%	-0.00%
$D_t/Y_t^b$	0.00%	0.39%	0.40%	0.35%	0.24%	0.09%	-0.13%	-0.41%	-0.75%	-1.25%	-0.11%	0.00%
$G_t/Y_t^b$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%

<sup>a</sup> The macroeconomic variables in the table are GDP ( $Y_t$ ), aggregate consumption ( $C_t$ ), aggregate investment ( $I_t$ ), aggregate capital stock ( $K_t$ ), aggregate labor ( $L_t$ ), average wage ( $w_t$ ), interest rate or rate of return on savings ( $r_t$ ), government revenue ( $Rev_t$ ), government debt ( $D_t$ ), government spending on public goods ( $G_t$ ), debt-to-GDP ratio ( $D_t/Y_t$ ), and government spending as a percent of GDP ( $G_t/Y_t$ ).

<sup>b</sup> The changes in debt-to-GDP ratio ( $D_t/Y_t$ ) and government spending as a percent of GDP ( $G_t/Y_t$ ) are reported as percentage point differences (simple differences) rather than percent changes to avoid zeros in the denominator.

**Table 8. Time path and steady-state pct. changes for macro variables from GAIN Act plus MTR increase, small open economy**

Macro var. <sup>a</sup>	Year										Avg. 10-yr	Steady state
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
$Y_t$	-1.61%	-1.77%	-1.76%	-1.74%	-1.72%	-1.72%	-1.73%	-1.74%	-1.77%	-1.63%	-1.72%	-1.48%
$C_t$	-0.73%	-0.87%	-0.99%	-1.10%	-1.19%	-1.28%	-1.35%	-1.42%	-1.48%	-1.50%	-1.19%	-1.74%
$I_t$	-3.13%	-1.63%	-1.44%	-1.60%	-1.67%	-1.80%	-1.85%	-2.13%	0.39%	-1.41%	-1.63%	-1.48%
$K_t$	-1.61%	-1.77%	-1.76%	-1.74%	-1.72%	-1.72%	-1.73%	-1.74%	-1.77%	-1.63%	-1.72%	-1.48%
$L_t$	-1.61%	-1.77%	-1.76%	-1.74%	-1.72%	-1.72%	-1.73%	-1.74%	-1.77%	-1.63%	-1.72%	-1.48%
$w_t$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
$r_t$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
$Rev_t$	-3.63%	-1.32%	-0.84%	-0.40%	0.03%	0.51%	0.99%	1.47%	1.94%	-0.09%	-0.13%	-0.00%
$D_t/Y_t^b$	0.00%	0.32%	0.26%	0.15%	0.02%	-0.16%	-0.37%	-0.62%	-0.90%	-1.41%	-0.27%	-0.00%
$G_t/Y_t^b$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.00%	0.00%	0.15%

<sup>a</sup> The macroeconomic variables in the table are GDP ( $Y_t$ ), aggregate consumption ( $C_t$ ), aggregate investment ( $I_t$ ), aggregate capital stock ( $K_t$ ), aggregate labor ( $L_t$ ), average wage ( $w_t$ ), interest rate or rate of return on savings ( $r_t$ ), government revenue ( $Rev_t$ ), government debt ( $D_t$ ), government spending on public goods ( $G_t$ ), debt-to-GDP ratio ( $D_t/Y_t$ ), and government spending as a percent of GDP ( $G_t/Y_t$ ).

<sup>b</sup> The changes in debt-to-GDP ratio ( $D_t/Y_t$ ) and government spending as a percent of GDP ( $G_t/Y_t$ ) are reported as percentage point differences (simple differences) rather than percent changes to avoid zeros in the denominator.

In the case of the GAIN Act alone, the increased government debt quickly crowds out investment and causes the economy to start shrinking significantly. It is only after a large fiscal adjustment of a 3.5-percentage point reduction in government non-transfer spending as a percent of GDP 20 years after the policy change that the economy stabilizes.

In the revenue neutral case in which top marginal tax rates are increased in addition to the EITC expansion, the cost is primarily in terms of large increases in labor supply frictions and a reallocation of the household labor-leisure and consumption-savings decisions. Labor supply and consumption both decrease in the first five years. The long-run declines in GDP and wages are more pronounced in this scenario.

The EITC provides a powerful safety net for poor Americans. However, the costs in terms of government debt, redistribution,

and effects on wages and interests rates must be taken into account to fully assess the true value of the policy.

## Modeling Notes

### OG-USA

**OG-USA** is an open source dynamic general equilibrium overlapping generations model of the U.S. economy. The OG-USA model is written in Python and includes realistic demographics, productivity growth, household response to consumption, labor supply, and savings, intended and unintended bequests, realistic household taxes, government ability to run deficits and surpluses, and a closed economy or small open economy option. All analyses used OG-USA release 0.5.6. All documentation and code are available in the OG-USA

GitHub repository (<https://github.com/open-source-economics/OG-USA>). Careful documentation for the OG-USA model, its derivation, output, and solution method is available in the OG-USA repository.

### Tax-Calculator

**Tax-Calculator** (release 0.16.2) is an open source microsimulation model that is able to simulate a rich set of policy changes to the U.S. federal individual income tax system. In conjunction with micro data that represent the U.S. population and a set of behavioral assumptions, Tax-Calculator can be used to conduct static revenue scoring and distributional analyses of tax policies. All documentation and code are available in the Tax-Calculator GitHub repository (<https://github.com/open-source-economics/Tax-Calculator>).

### Modeling Assumptions

These analyses make use of OG-USA simulations, some of which assume a closed economy and others that assume a small open economy. Our simulations from OG-USA assume no Federal Reserve response to changes in interest rates and a budget closure rule that takes effect in 2038 and reduces government spending to stabilize the debt-to-GDP ratio at 100%.

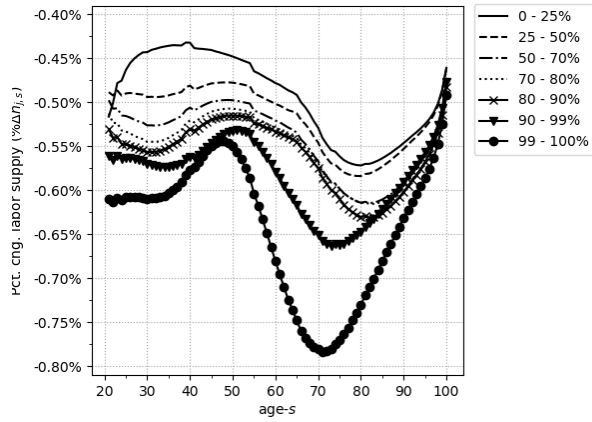
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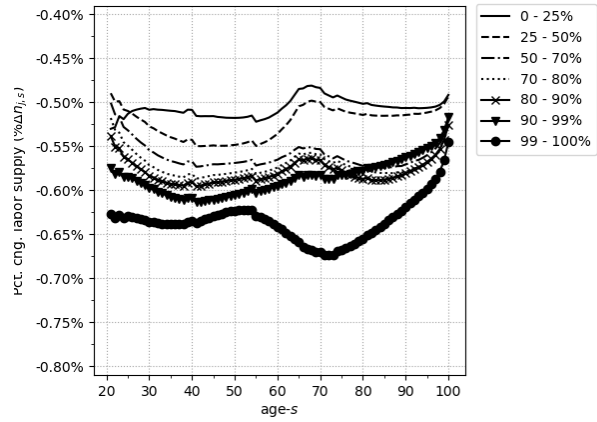
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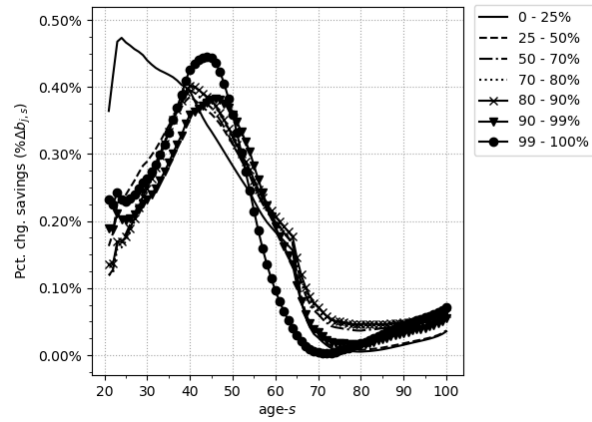
**Figure 2. Average percent change in household labor supply, savings, and consumption by age and ability groups from GAIN Act alone: 2018-2022**



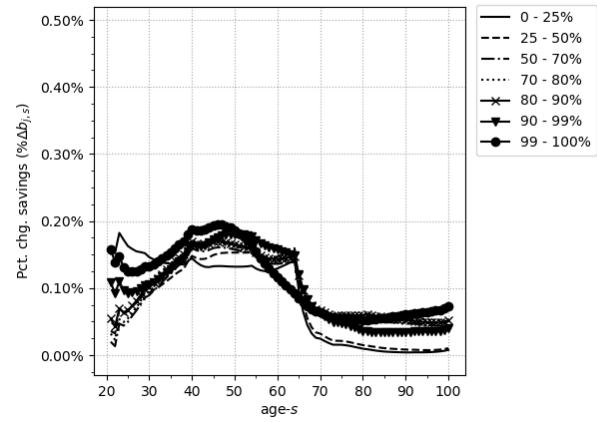
**(a) Labor supply, closed economy**



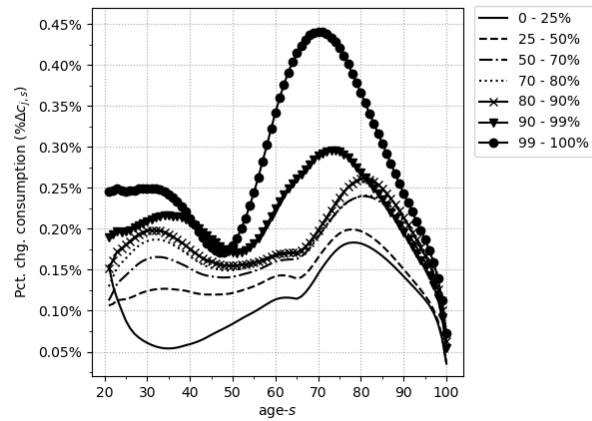
**(b) Labor supply, small open economy**



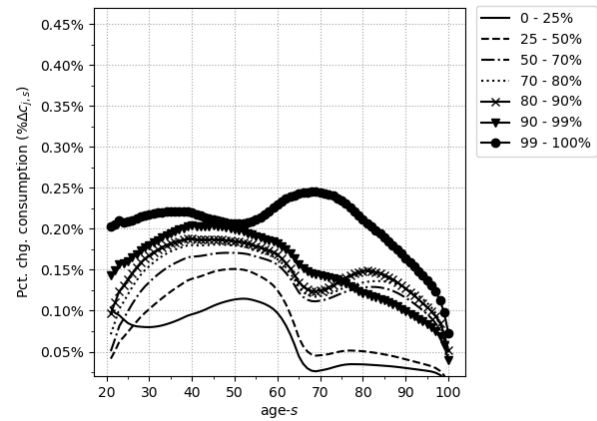
**(c) Savings, closed economy**



**(d) Savings, small open economy**

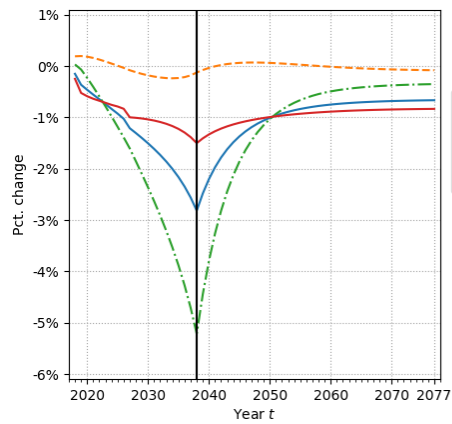


**(e) Consumption, closed economy**

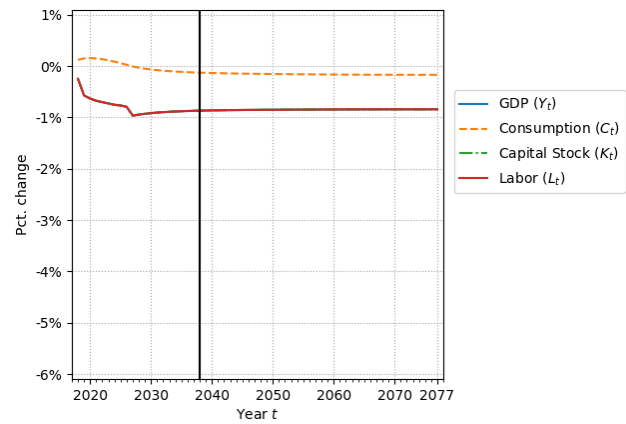


**(f) Consumption, small open economy**

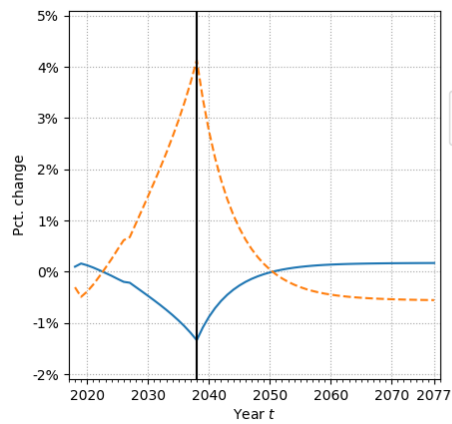
**Figure 3. Time path percent changes of aggregate macroeconomic variables, prices, and fiscal variables: GAIN Act alone**



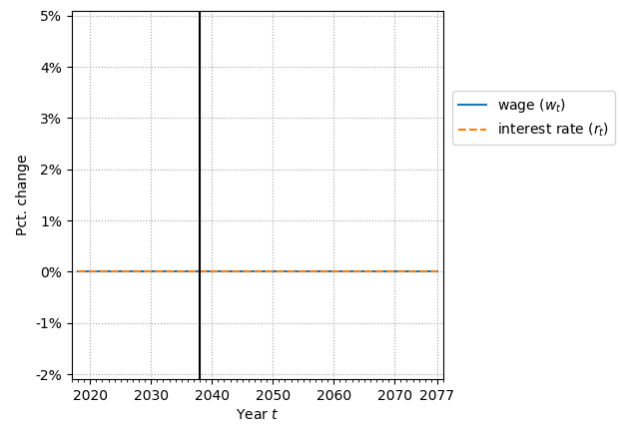
**(a)** Macro aggregates, closed economy



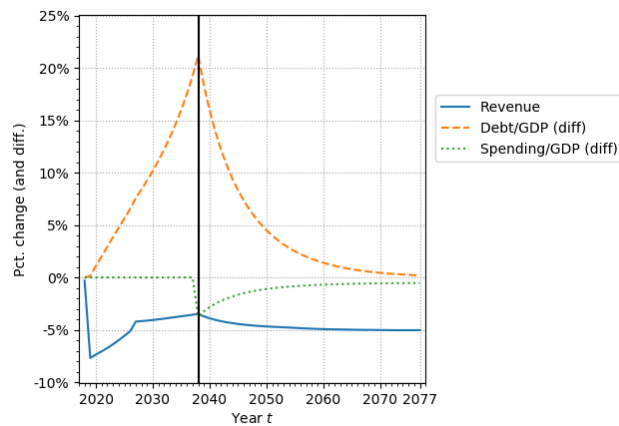
**(b)** Macro aggregates, small open economy



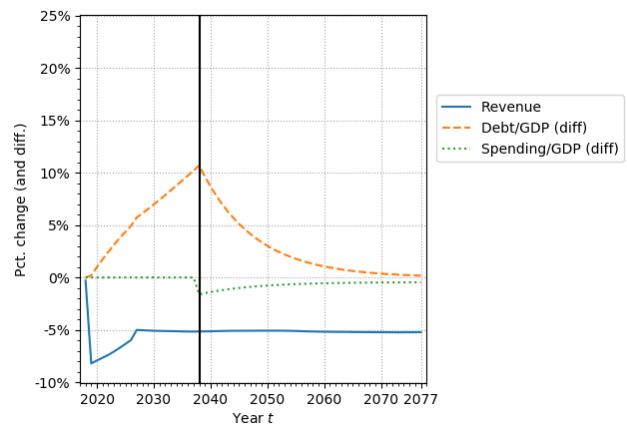
**(c)** Prices, closed economy



**(d)** Prices, small open economy

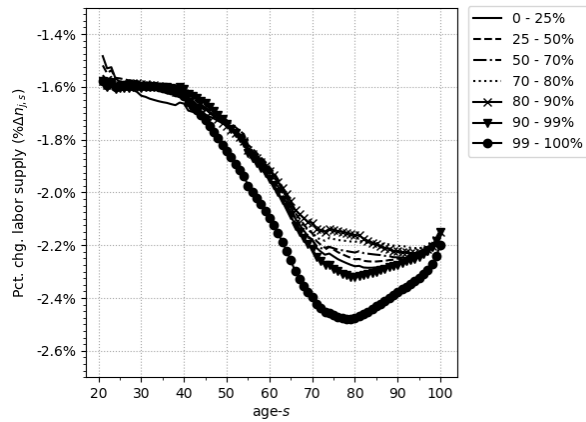


**(e)** Fiscal variables, closed economy

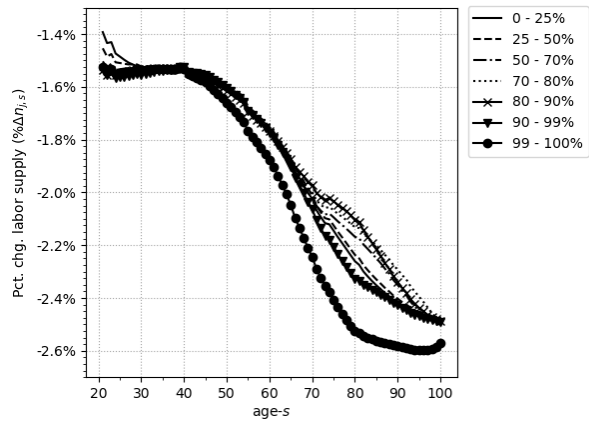


**(f)** Fiscal variables, small open economy

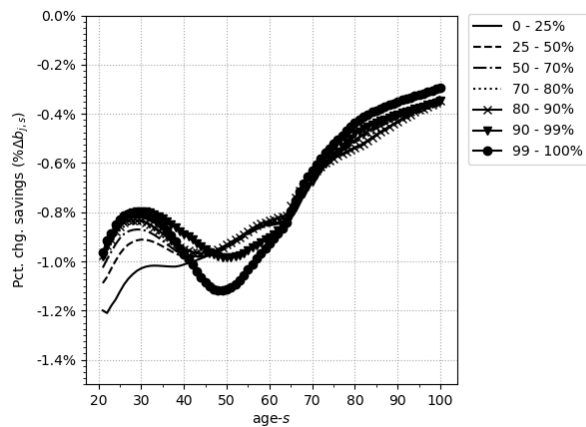
**Figure 4. Average percent change in household labor supply, savings, and consumption by age and ability groups from GAIN Act plus MTR increase: 2018-2022**



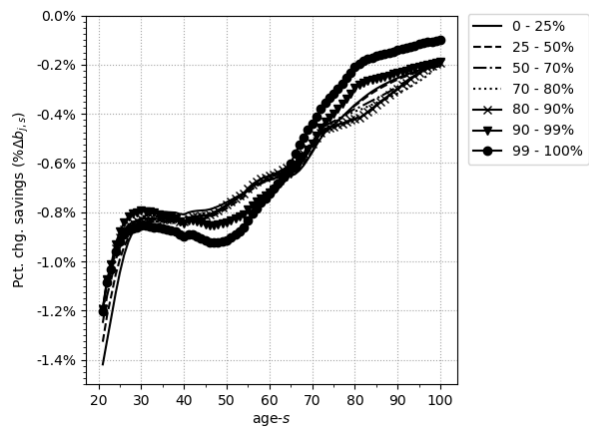
**(a) Labor supply, closed economy**



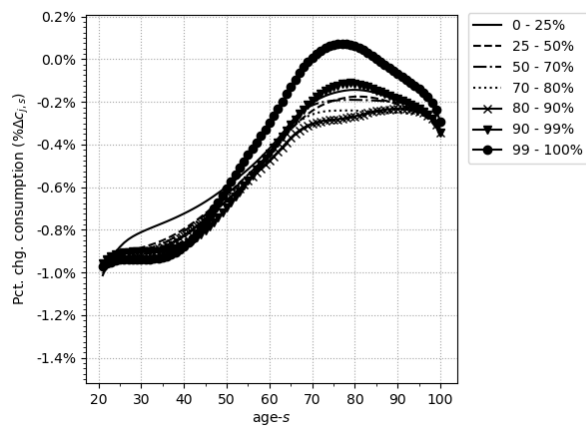
**(b) Labor supply, small open economy**



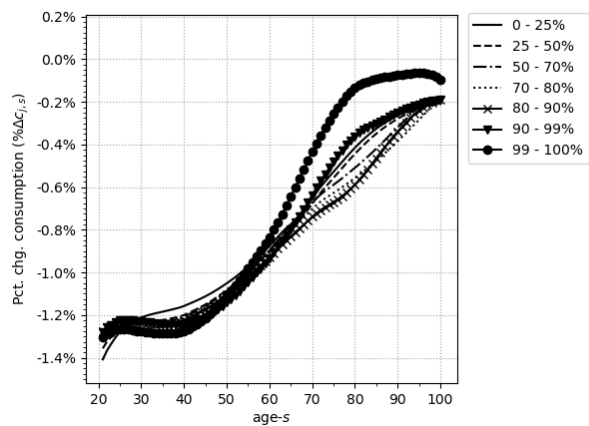
**(c) Savings, closed economy**



**(d) Savings, small open economy**

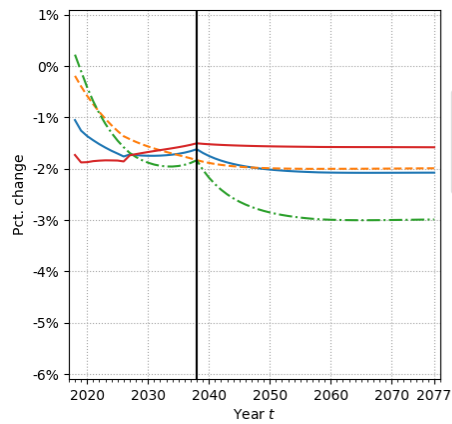


**(e) Consumption, closed economy**

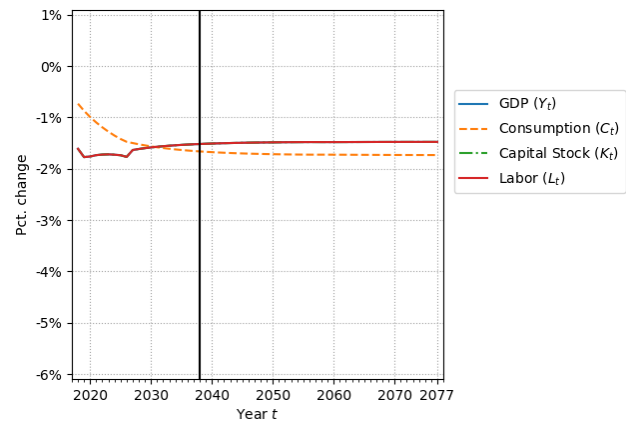


**(f) Consumption, small open economy**

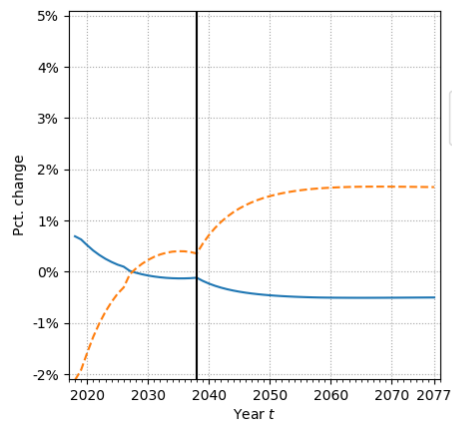
**Figure 5. Time path percent changes of aggregate macroeconomic variables, prices, and fiscal variables: GAIN Act plus MTR increase**



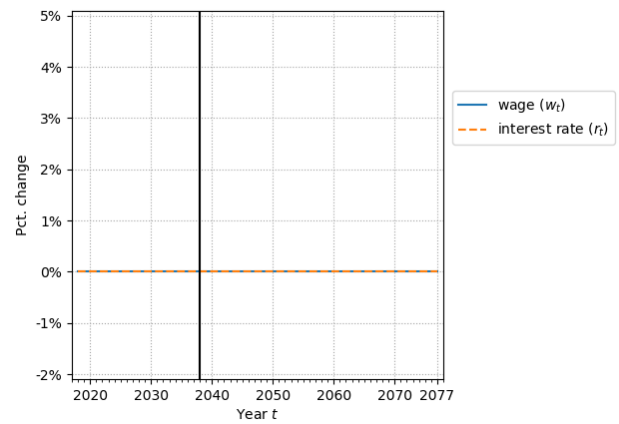
**(a)** Macro aggregates, closed economy



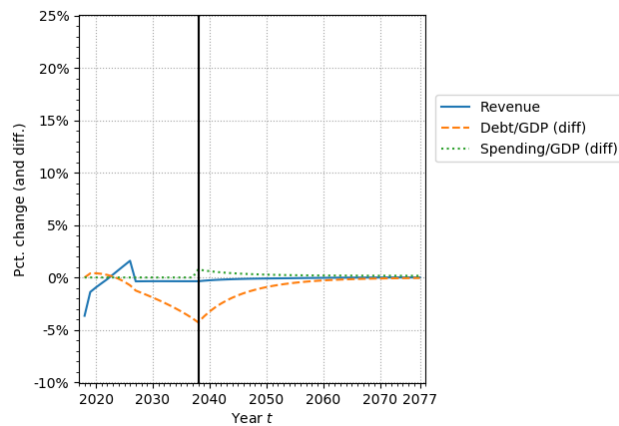
**(b)** Macro aggregates, small open economy



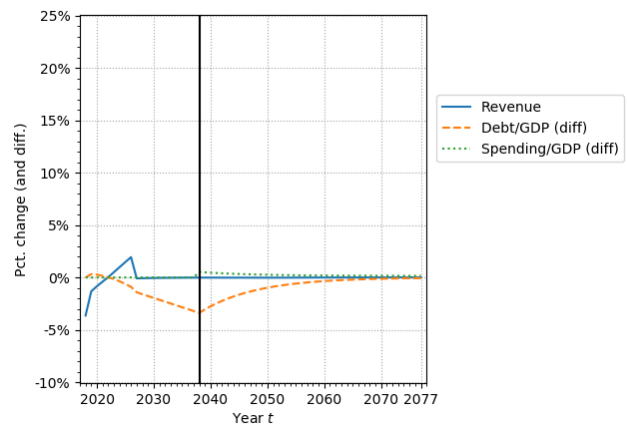
**(c)** Prices, closed economy



**(d)** Prices, small open economy



**(e)** Fiscal variables, closed economy



**(f)** Fiscal variables, small open economy