



Wharton  
UNIVERSITY of PENNSYLVANIA

# Advances in Public Policy Modeling

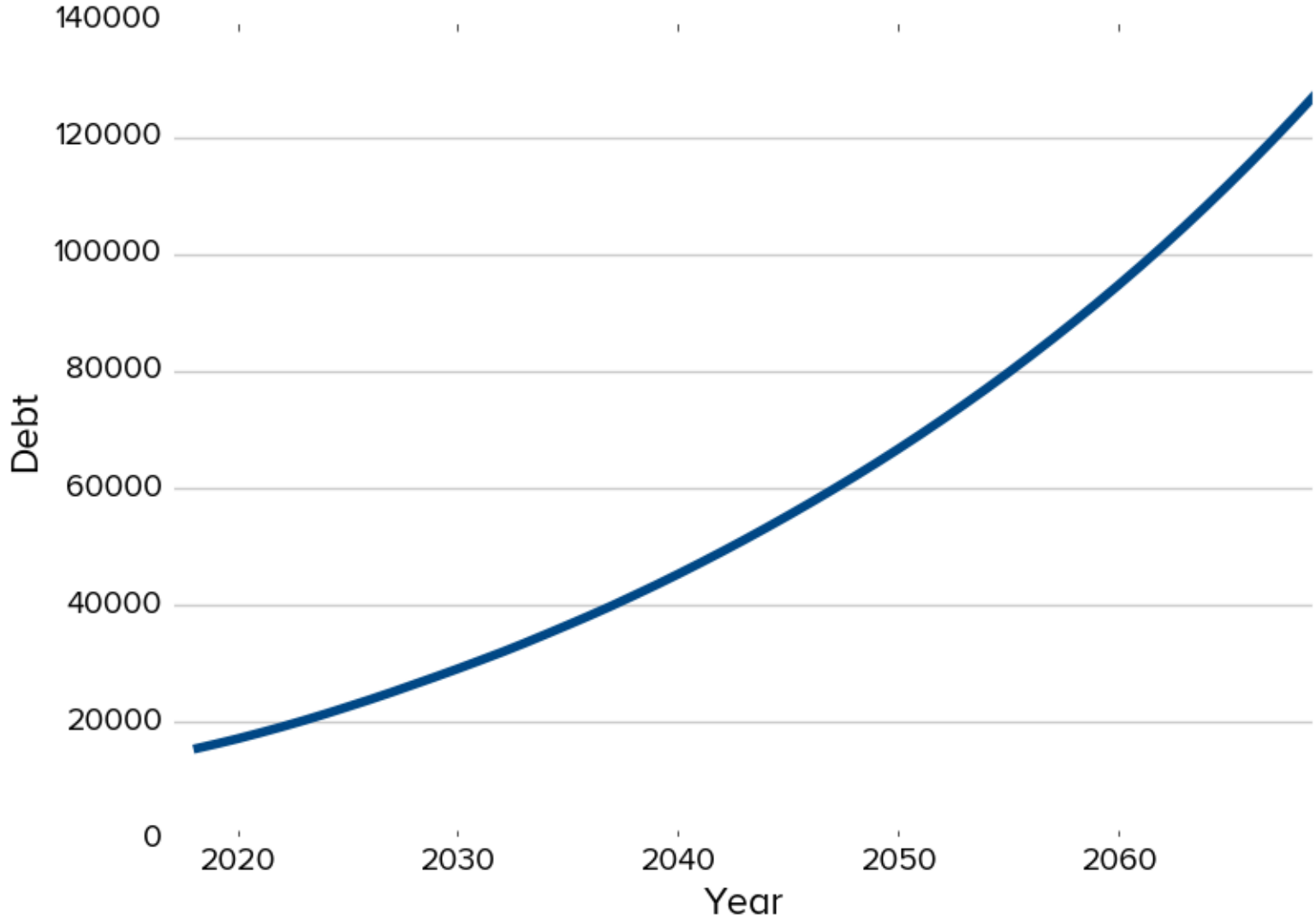
*The Penn Wharton Budget Model*

Kent Smetters \ November, 15 2018

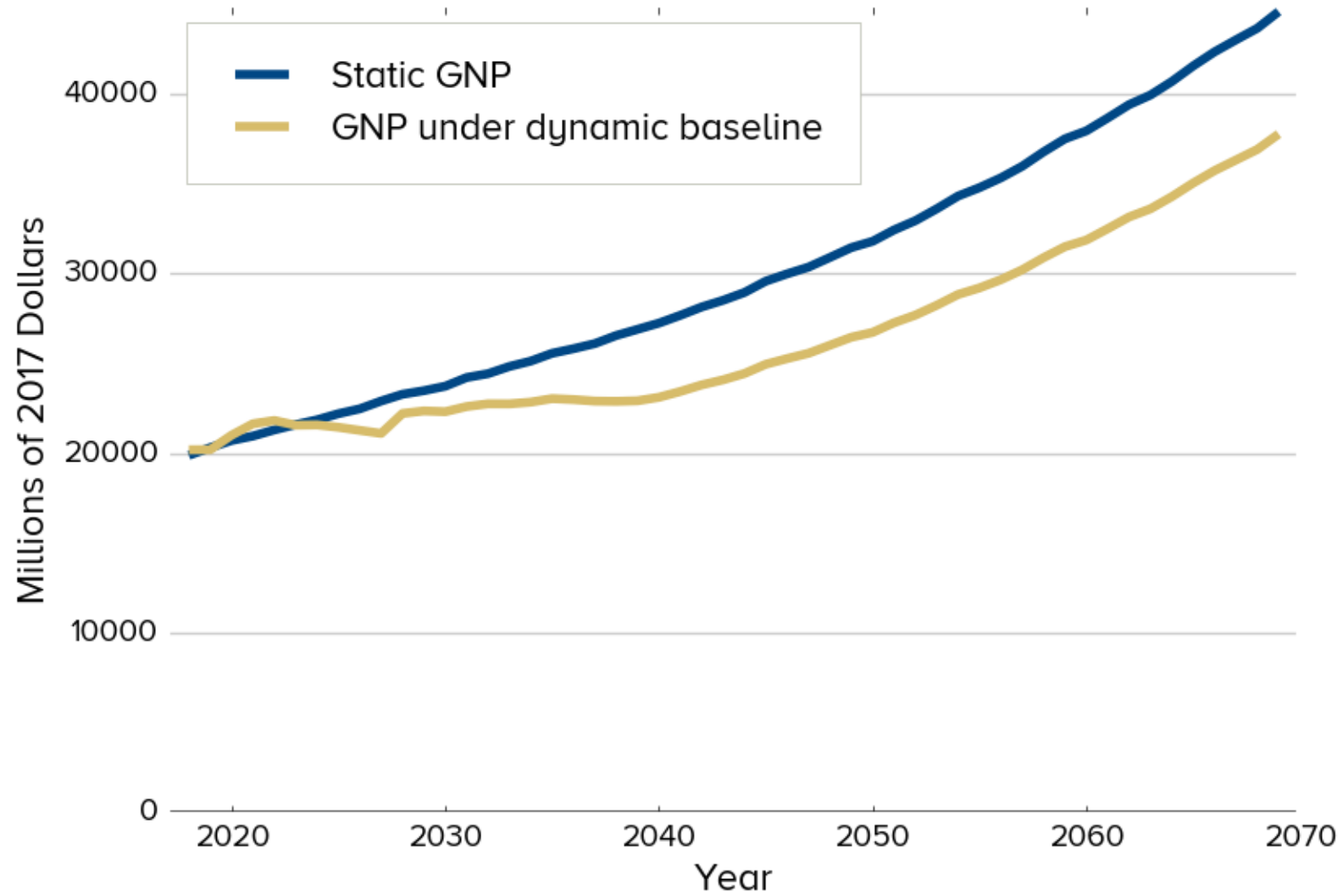
# Overview

- 1) Use cutting-edge economic modeling, data science and cloud computing to provide policymakers and support staff with a transparent platform that projects the impact on the budget and economy while writing legislation.
- 2) Regular convening with members, federal agencies and support committees

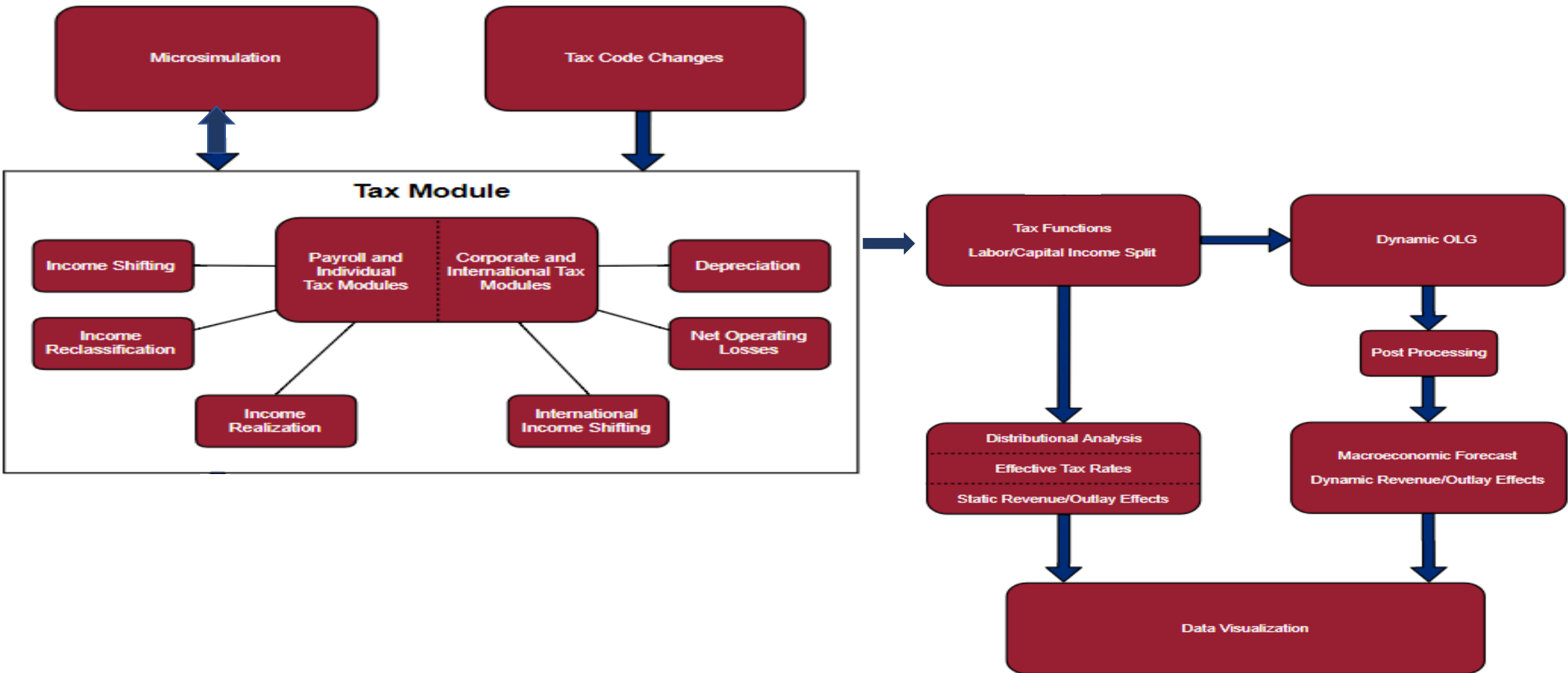
# Where is the United States Headed? More Debt



# Debt has a Snowball Effect on GDP



# Example: PWBM Model with Tax Module

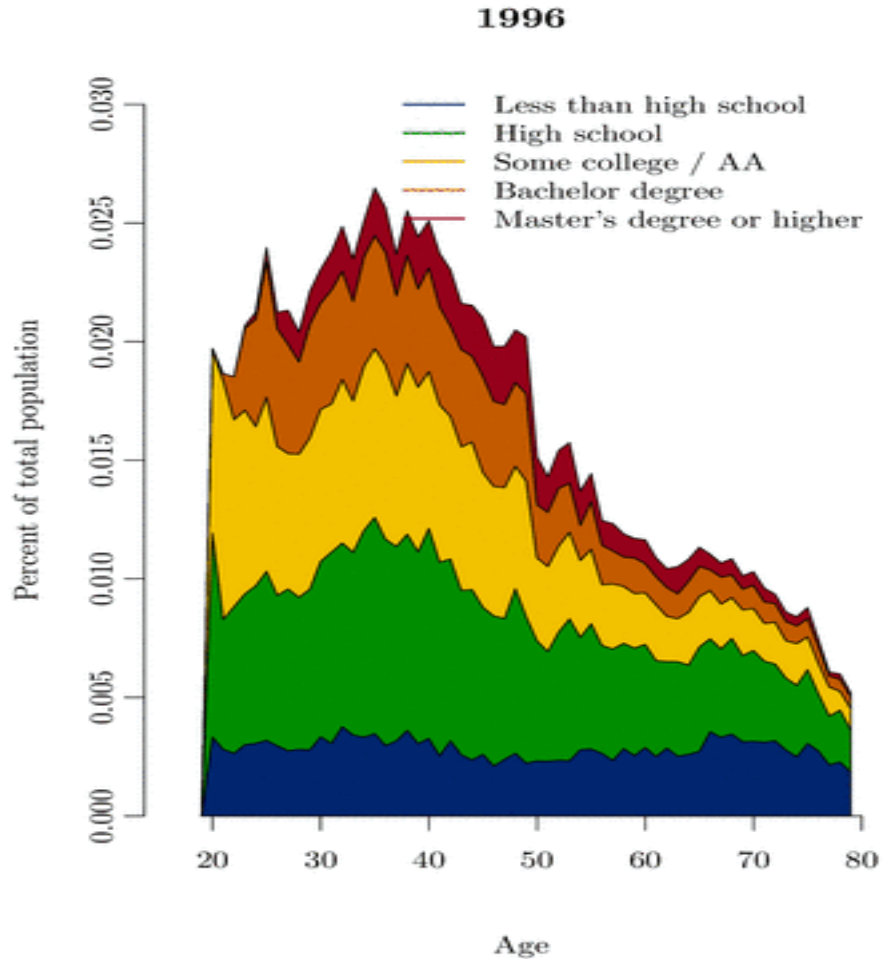


We always validate before projecting  
forward:

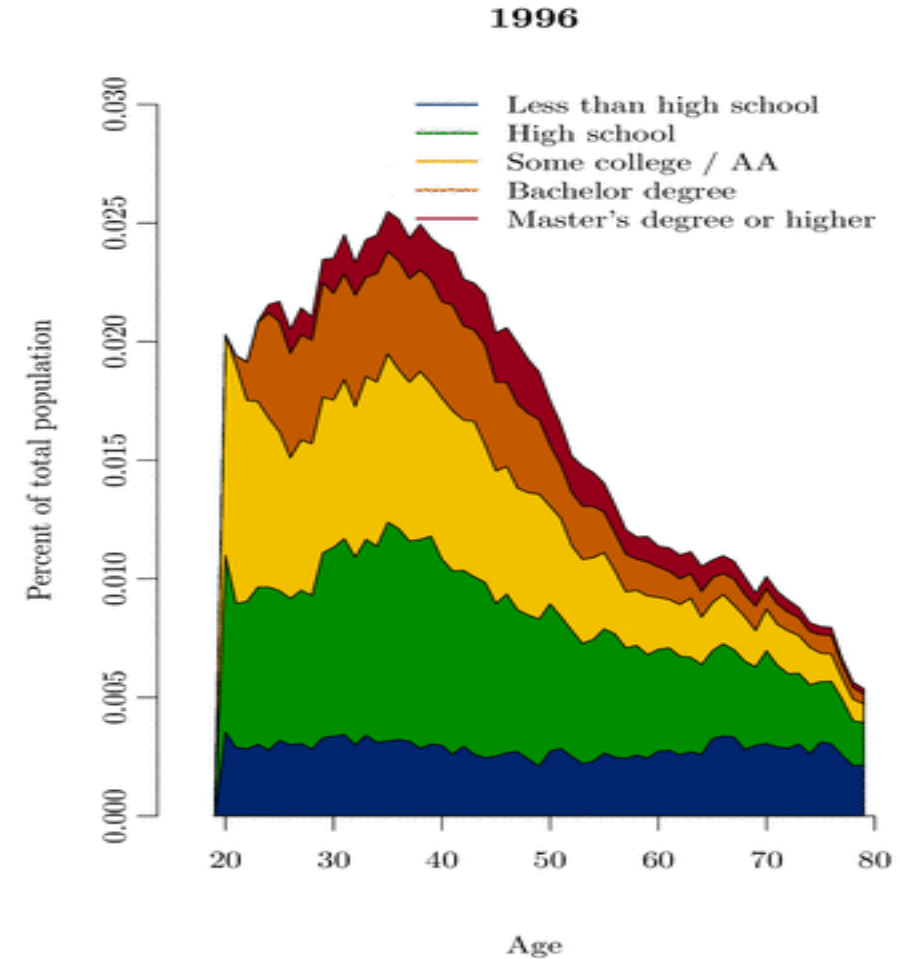
A few examples

# Education (1996 – 2070)

## Census Data

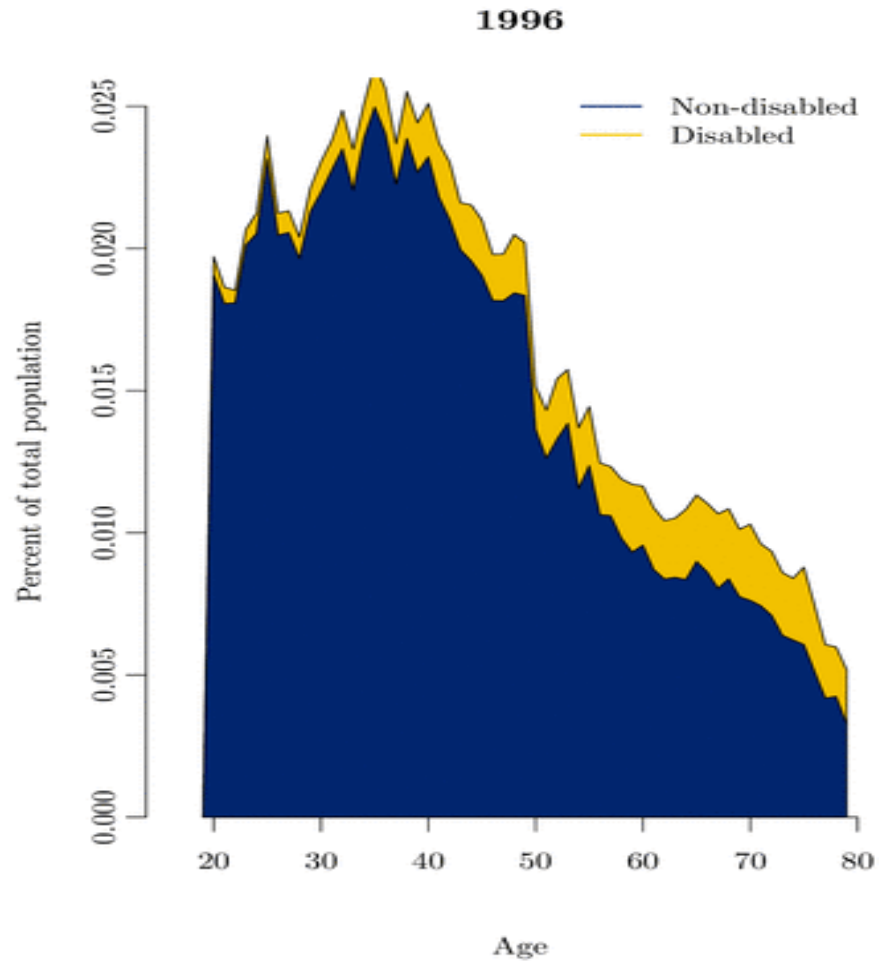


## Microsimulation

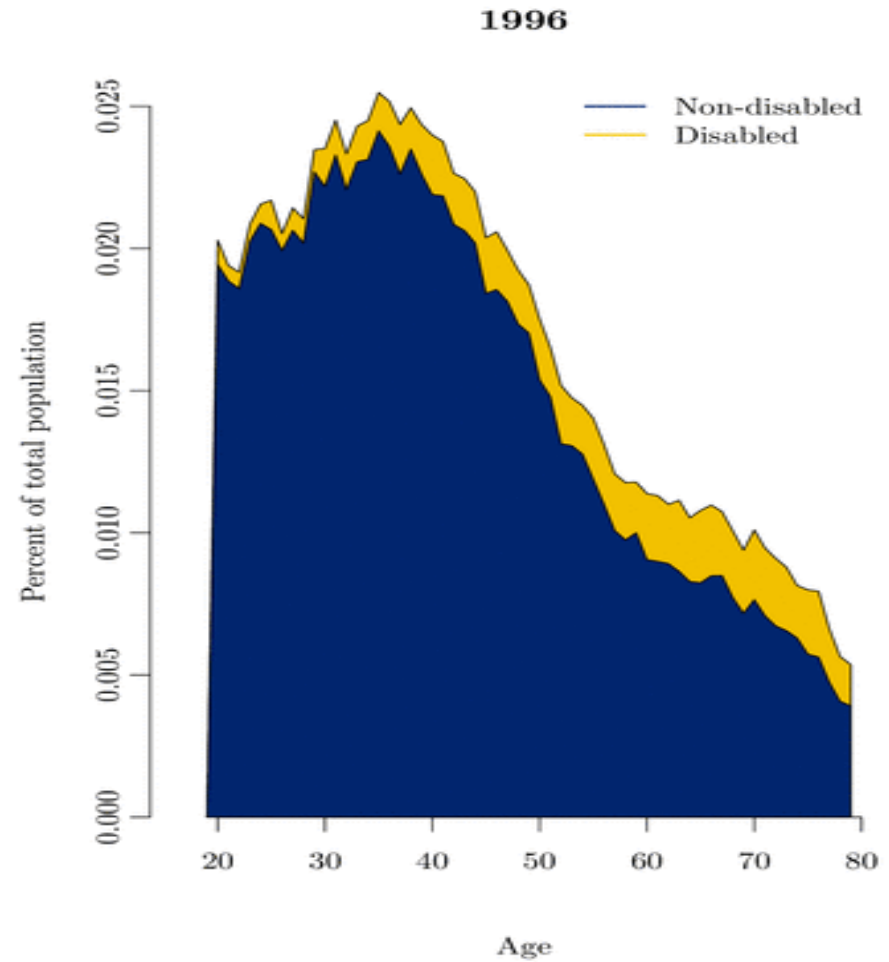


# Disability (1996 – 2070)

## Census Data



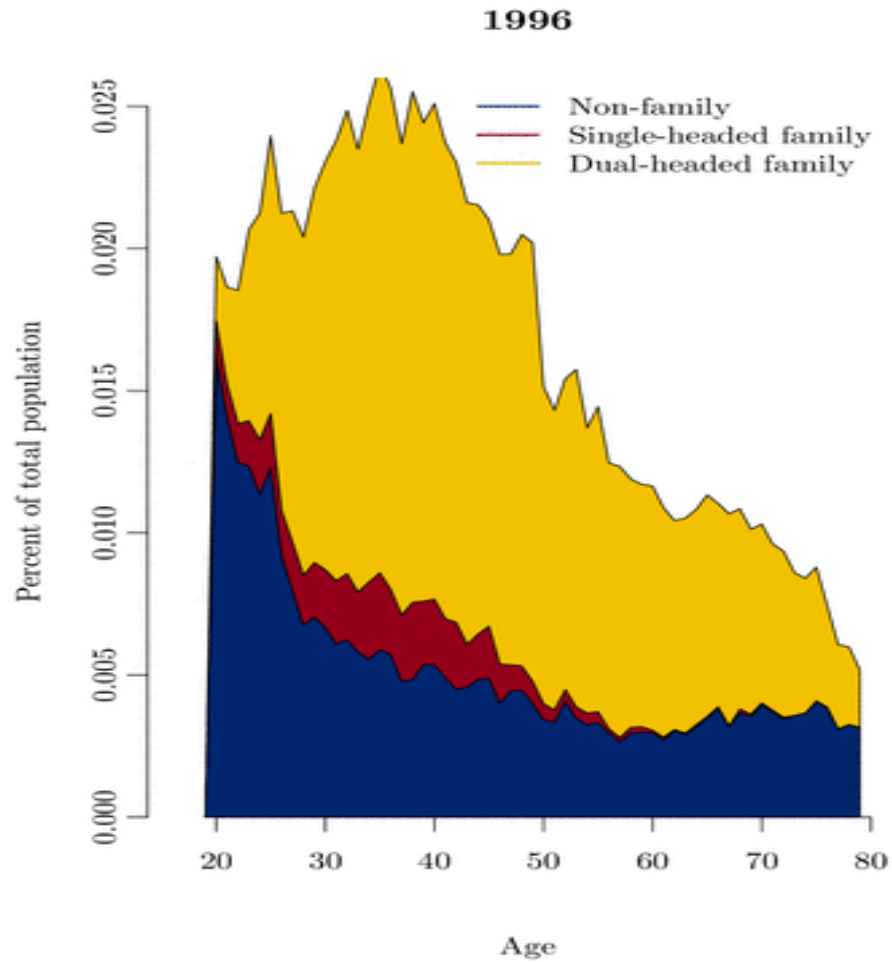
## Microsimulation



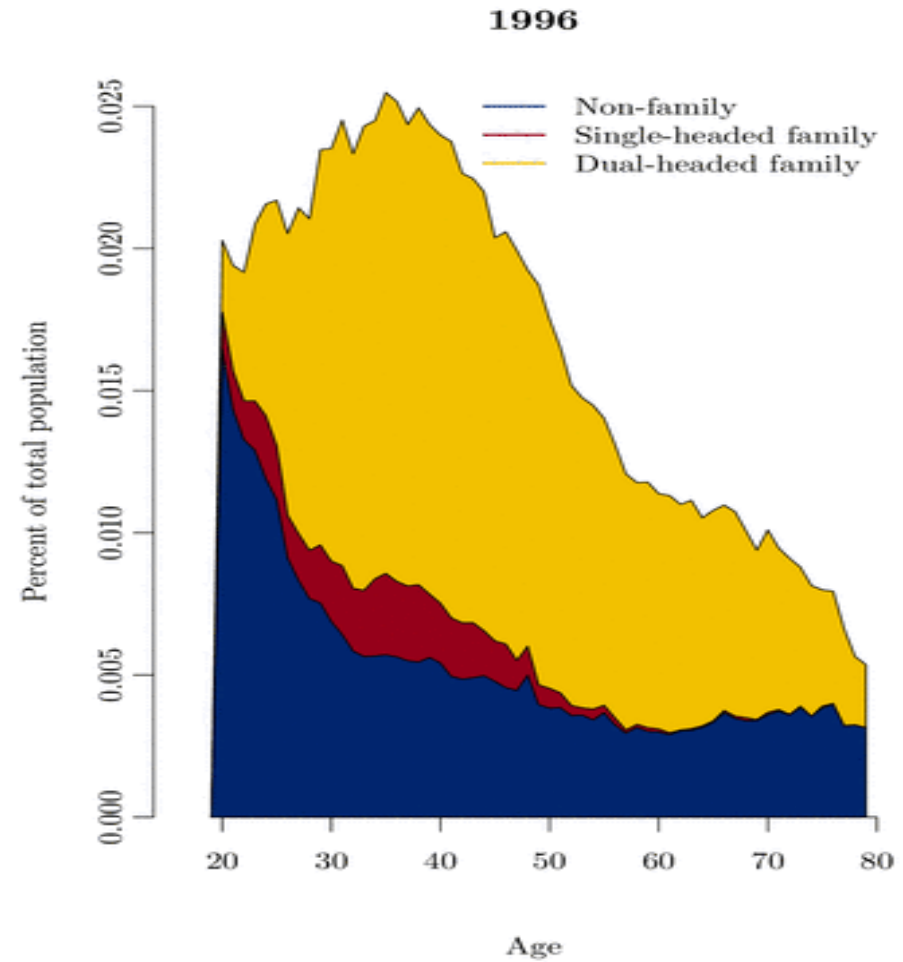


# Family Composition (1996 – 2070)

## Census Data

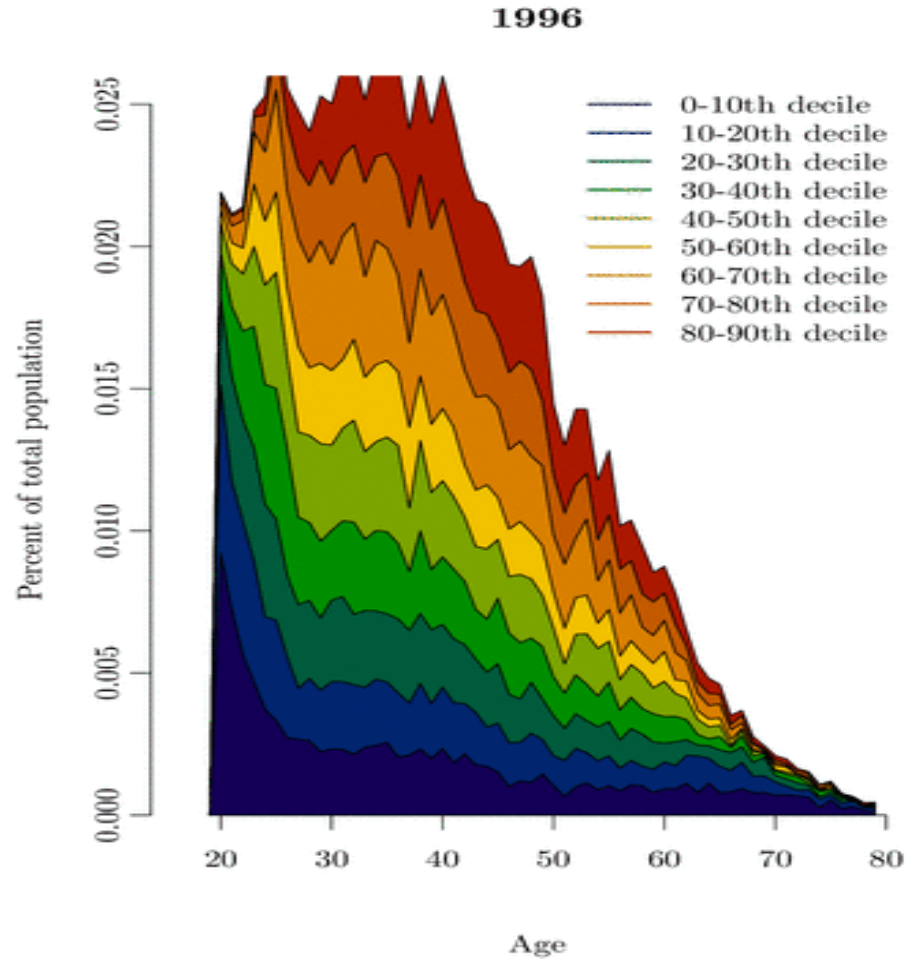


## Microsimulation

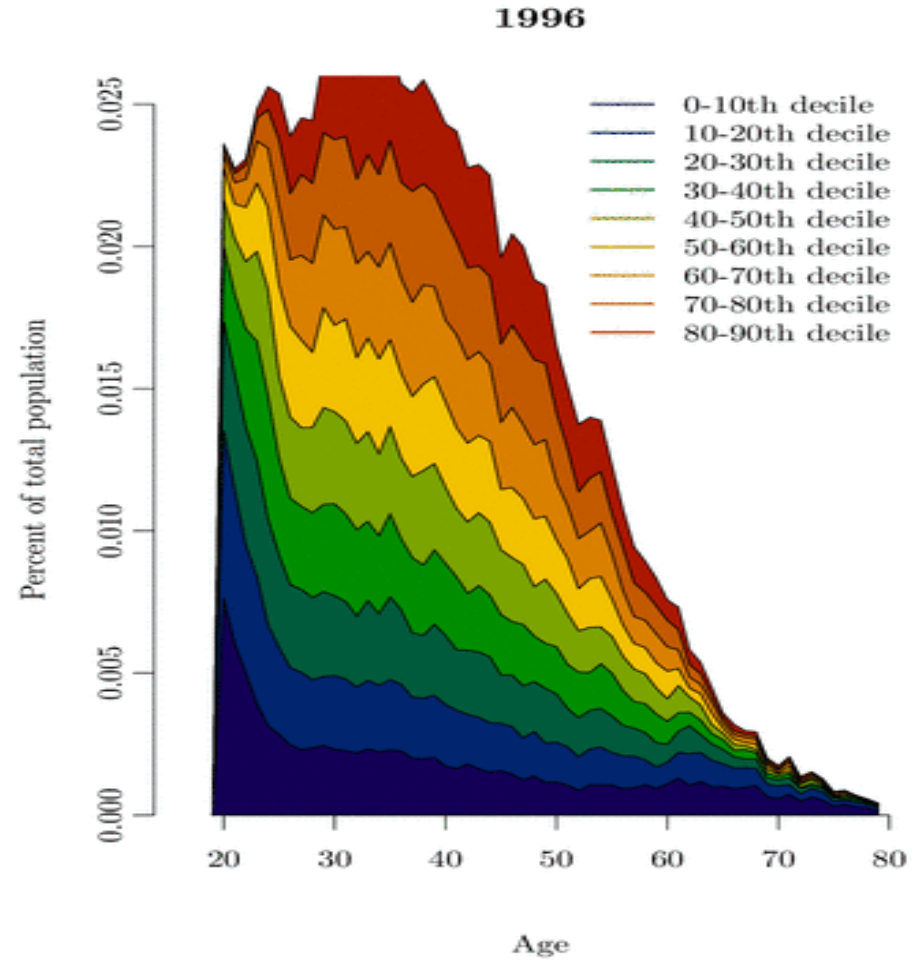


# Wage income deciles (1996 – 2070)

## Census Data

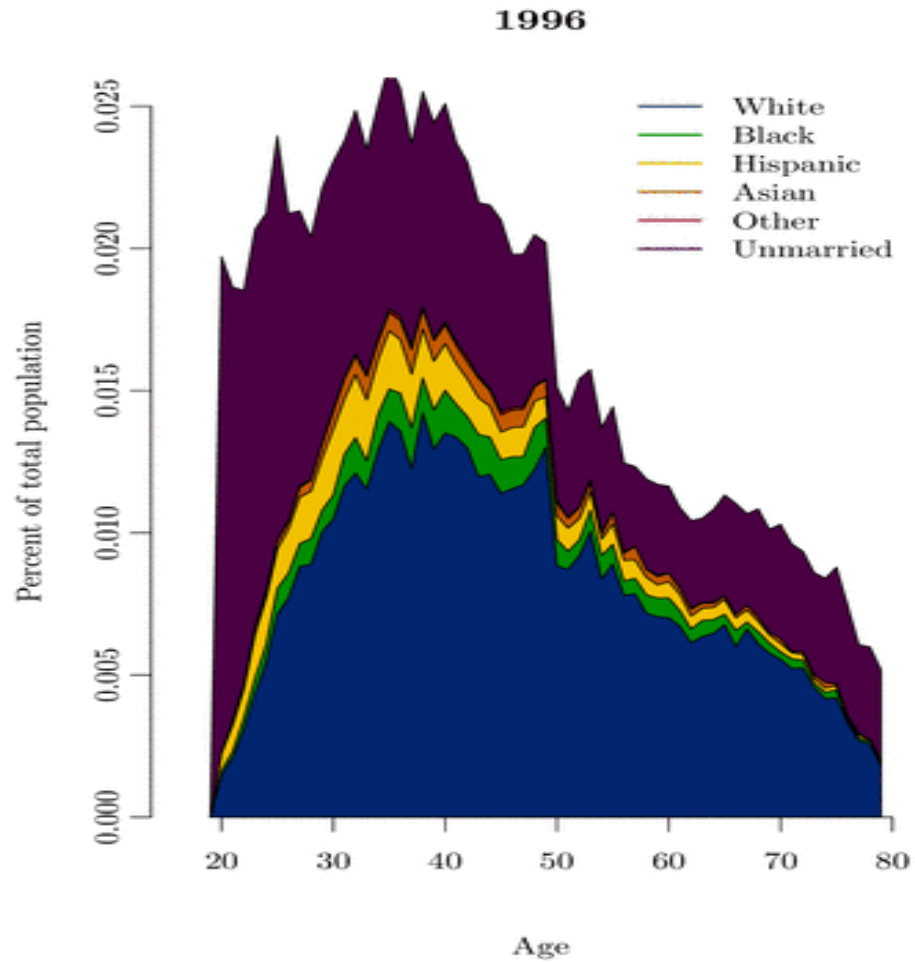


## Microsimulation

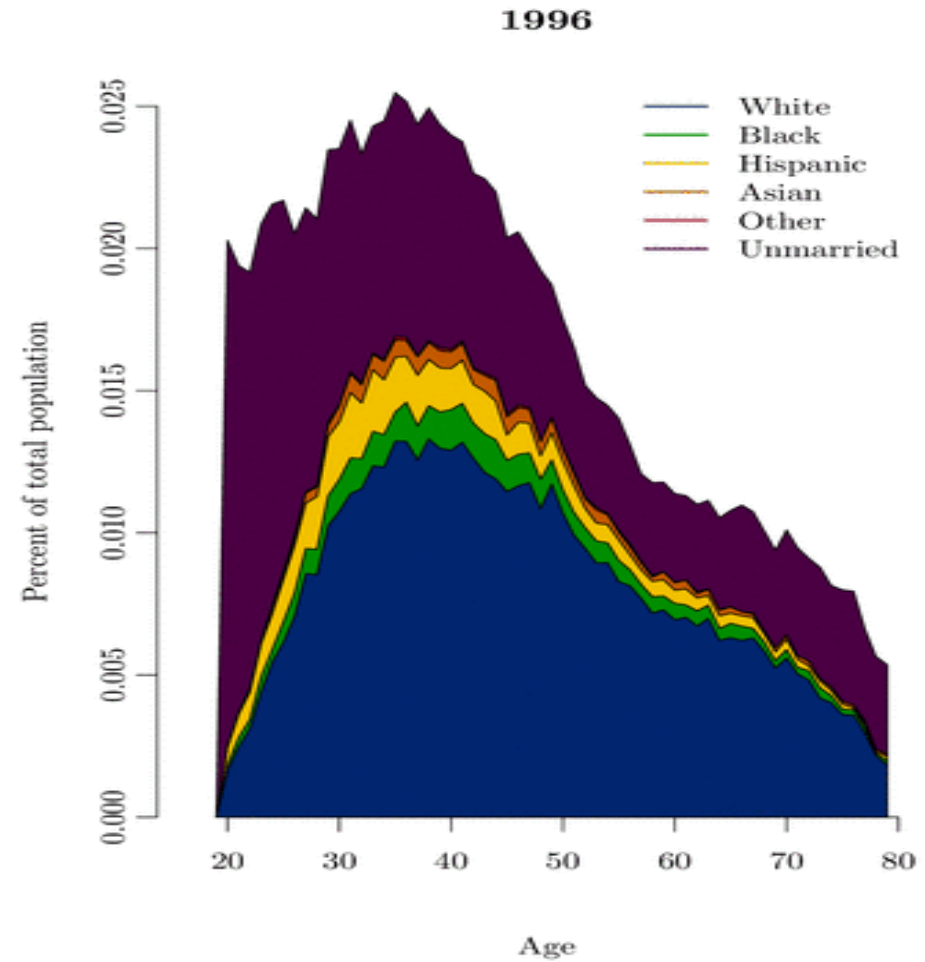


# Marriage (1996 – 2070)

## Census Data



## Microsimulation



# “The Tax Cut and Jobs Act”

## Static Analysis

# Revenue Impact

## Individual

Tax Provision	Revenue Effect 2018-2027 (billions of \$)		Revenue Effect 2018-2040 (billions of \$)
	JCT	PWBM	PWBM
New tax rate and bracket structure	-1,214	-1,307	-1,364
Expand the standard deduction and repeal personal exemptions	491	438	438
Index tax provisions to chained CPI	134	88	765
New pass-through business deduction	-415	-542	-758
Pass-through business loss limits	150	140	114
Expand Child Tax Credit (CTC) and new non-child dependent credit	-573	-511	-532

## Individual (cont.)

Tax Provision	Revenue Effect 2018-2027 (billions of \$)		Revenue Effect 2018-2040 (billions of \$)
	JCT	PWBM	PWBM
Repeal and modifications to itemized deductions	668	459	496
Alternative Minimum Tax (AMT) changes	-637	-317	-313
Reforms to certain deductions and credits	25	26	9
Reforms to certain individual tax expenditures, including the ACA's individual mandate	328	328	1,169
Estate Tax Exemption Doubled	-83	-83	-83
<b>Subtotal</b>	<b>-1,127</b>	<b>-1,281</b>	<b>-59</b>

## Corporate

Tax Provision	Revenue Effect 2018-2027 (billions of \$)		Revenue Effect 2018-2040 (billions of \$)
	JCT	PWBM	PWBM
Corporate tax rate 21% starting 2019	-1,389	-1,435	-4,185
Net interest deduction capped at 30% of income	253	193	753
Changes to the treatment of investment	-86	-180	-152
Modification to net operating loss deductions	201	145	169
Amortize research & experimentation	120	51	88
Repeal of Domestic Production Deduction	98	100	300
Reforms to certain business tax expenditures	149	148	584
<b>Subtotal</b>	<b>-654</b>	<b>-978</b>	<b>-2,443</b>

## International

Tax Provision	Revenue Effect 2018-2027 (billions of \$)		Revenue Effect 2018-2040 (billions of \$)
	JCT	PWBM	PWBM
Territorial System	-224	-173	-509
Special one-time repatriation rate	339	254	232
Other international reforms	<u>210</u>	<u>210</u>	<u>772</u>
<b>Subtotal</b>	<b>324</b>	<b>291</b>	<b>495</b>



## Aggregated

Major Category *	Revenue Effect 2018-2027 (billions of \$)		Revenue Effect 2018-2040 (billions of \$)
	JCT	PWBM	PWBM
Individual	-1,127	-1,281	-59
Corporate	-654	-978	-2,443
International	324	291	495
<b>Total (with Outlay Effects)</b>	<b>-1,456</b>	<b>-1,968</b>	<b>-2,007</b>
<b>Revenue (Total without Outlay Effects)</b>	<b>-1,649</b>	<b>-2,209</b>	<b>-3,077</b>

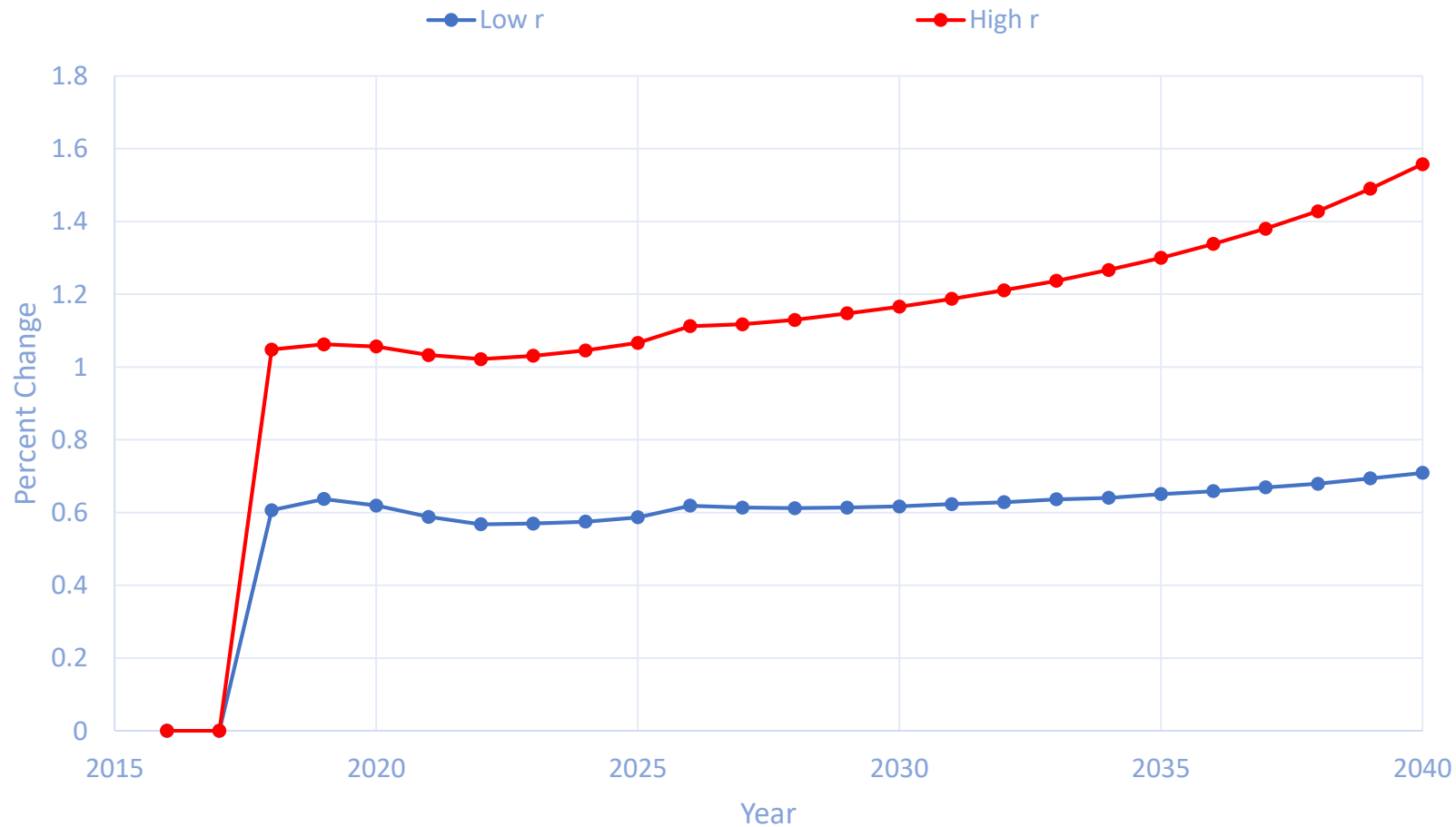
*We project \$500 billion more in lost revenue than experts at JCT, partly due to differences in assumed income shifting/reclassification.*

- We are similar to more recent CBO analysis*
- Regardless: static analysis is still king and big driver of dynamic*

# Adding: Dynamic Effects

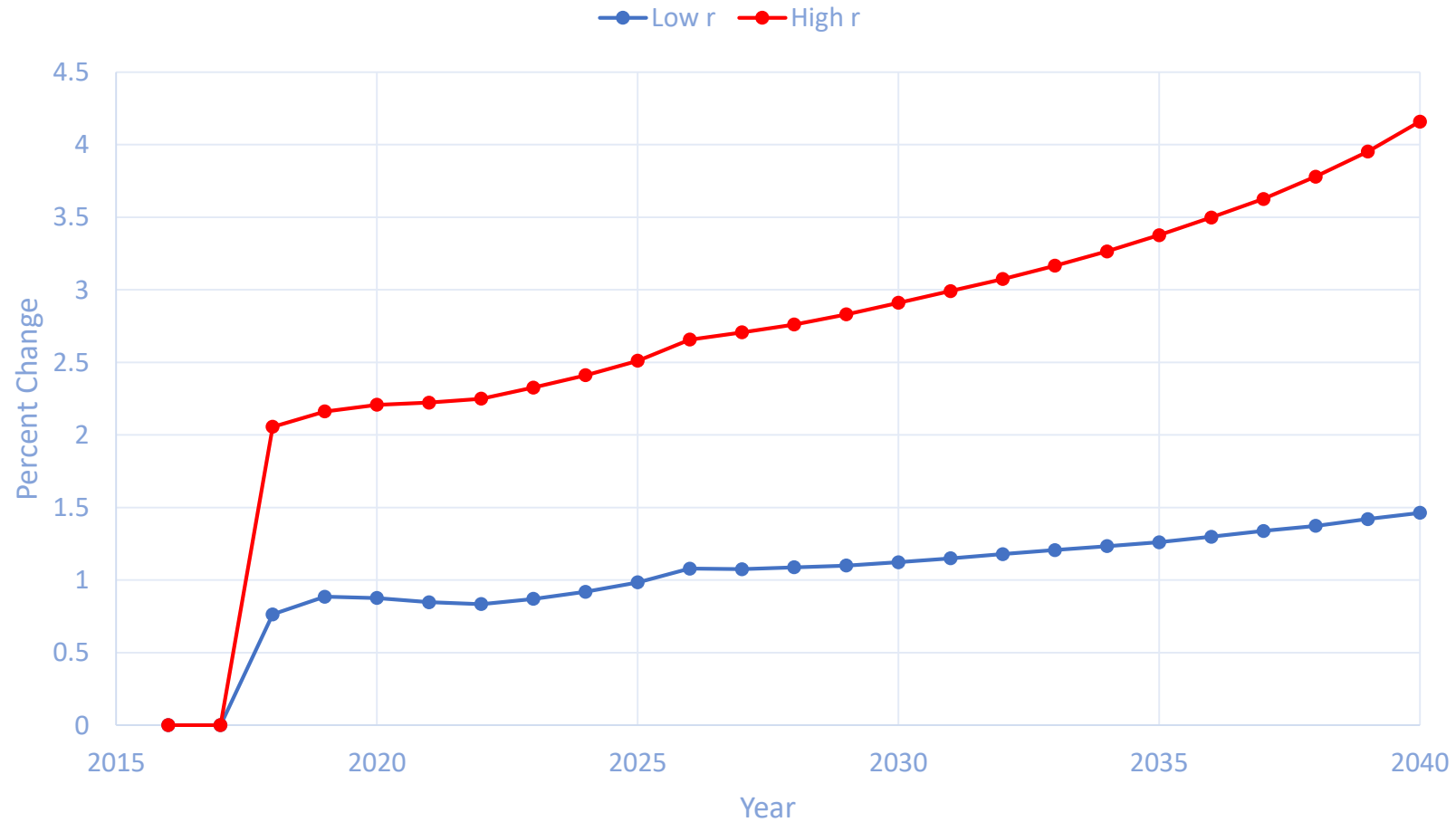
# U.S. Gross Domestic Product (GDP)

## Percent Change from Current Law



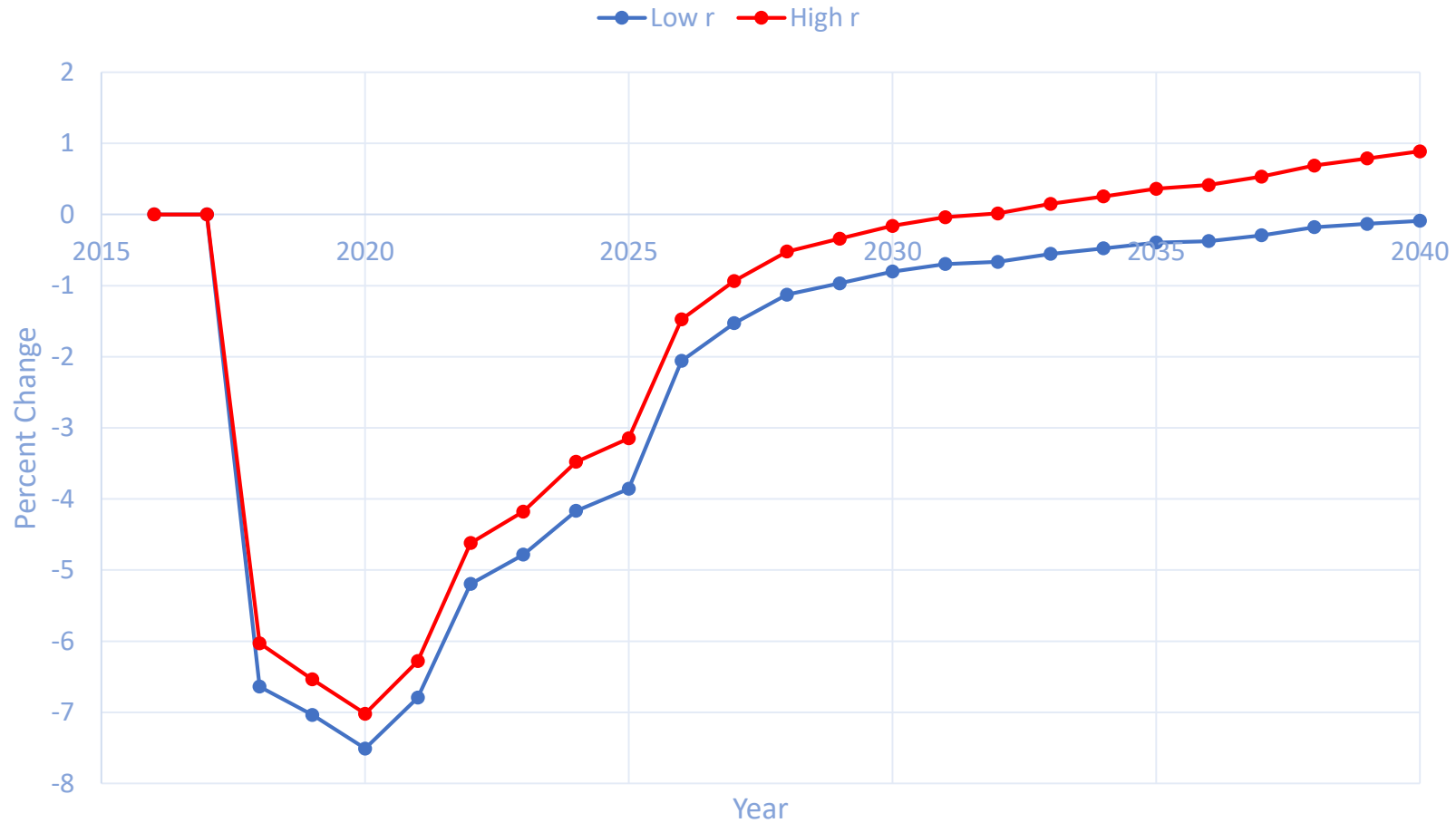
# Capital Services

## Percent Change from Current Law



# Federal Tax Revenues

## Percent Change from Current Law



	Average Annual GDP Growth Rate (percentage point change)	
Years	High return to capital	Low return to capital
2018-2027	0.12%	0.06%
2028-2040	0.03%	0.01%

Below “0.40%” target (actual target: 0.55%) required to self-fund

Lower long-run growth due to debt.

# Why Not Bigger?

Years	Cumulative Revenue (billions of \$)			Change in Debt (billions of \$)		
	Static	Dynamic		Static	Dynamic	
		High return to capital	Low return to capital		High return to capital	Low return to capital
2018-2027	-\$2,209	-\$1,786	-\$2,038	\$2,387	\$1,941	\$2,238
2018-2040	-\$3,077	-\$1,540	-\$2,442	\$4,005	\$2,181	\$3,466



# Corporate Effective Tax Rates

Industry	Scenario	2018	2023	2027	2040
All industries	Current law	21.18	23.53	22.95	21.93
	TCJA	9.16	17.33	18.88	16.06

*We project that static ETR's will return most of the way to current law within 10 years => smaller impact on corporate side than first meets the eye*

- Substantial variation by industry (Appendix)*
- Temporary expensing substitutes for depreciation*





# APPENDIX

# Corporate Effective Tax Rates by Industry

## Service

Industry	Scenario	2018	2023	2027	2040
All industries	Current law	21.18	23.53	22.95	21.93
	TCJA	9.16	17.33	18.88	16.06
Accommodation and food services	Current law	15.13	16.29	15.41	13.60
	TCJA	8.46	10.60	10.42	7.83
Administrative and support and waste management and remediation services	Current law	25.68	28.50	27.75	26.46
	TCJA	13.90	19.82	20.30	16.34
Arts, entertainment, and recreation	Current law	26.61	30.09	29.10	27.37
	TCJA	15.37	23.04	23.99	20.40
Educational services	Current law	28.95	31.95	31.34	30.46
	TCJA	16.42	23.58	24.34	21.30
Health care and social assistance	Current law	29.42	32.40	31.57	29.54
	TCJA	16.59	24.04	24.76	21.10
Professional, scientific, and technical services	Current law	25.41	28.82	28.11	26.83
	TCJA	14.29	22.10	22.62	19.69
Other services	Current law	29.41	32.55	31.96	31.15
	TCJA	16.32	23.84	24.65	21.51

## Finance and Real Estate

Industry	Scenario	2018	2023	2027	2040
All industries	Current law	21.18	23.53	22.95	21.93
	TCJA	9.16	17.33	18.88	16.06
Finance and insurance	Current law	26.08	28.90	28.52	27.88
	TCJA	14.30	20.82	20.71	18.61
Real estate and rental and leasing	Current law	26.50	30.22	29.30	27.99
	TCJA	10.85	22.96	24.17	20.50
Management of companies (holding companies)	Current law	16.17	17.18	16.82	15.92
	TCJA	8.73	10.19	9.10	8.93
Information	Current law	22.40	25.23	24.63	23.63
	TCJA	12.76	19.34	19.91	16.46

## Manufacturing and Construction

Industry	Scenario	2018	2023	2027	2040
All industries	Current law	21.18	23.53	22.95	21.93
	TCJA	9.16	17.33	18.88	16.06
Construction	Current law	28.50	31.76	31.16	30.30
	TCJA	16.01	23.58	24.32	21.21
Manufacturing	Current law	17.51	19.36	18.77	17.68
	TCJA	10.94	15.92	16.26	14.02
Mining	Current law	15.83	18.66	17.56	16.01
	TCJA	7.37	11.87	14.64	2.88
Transportation and warehousing	Current law	28.78	31.86	31.27	30.52
	TCJA	15.97	23.23	24.22	21.31
Utilities	Current law	28.83	32.17	31.22	29.72
	TCJA	15.62	23.43	24.64	21.42

## Trade

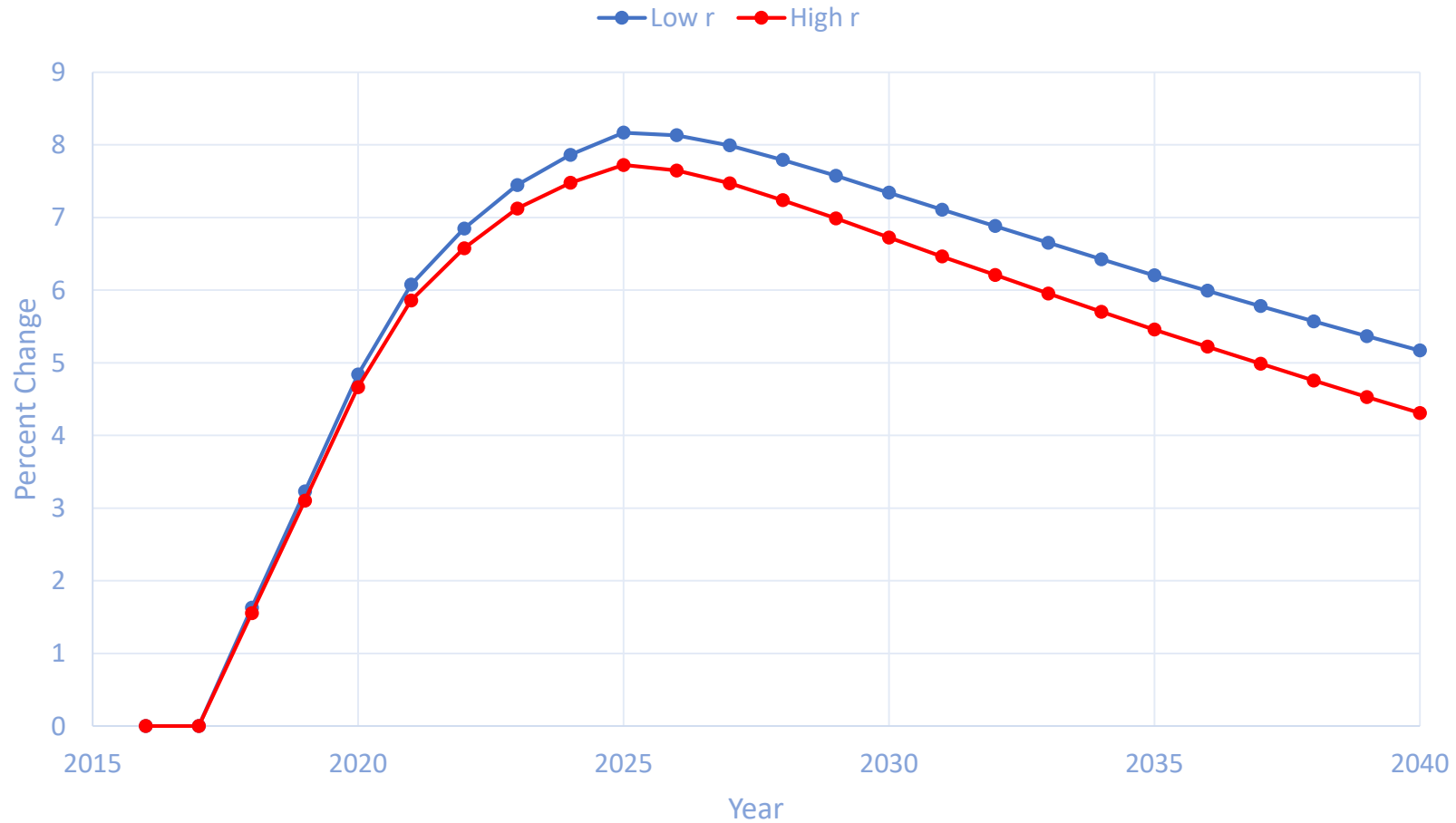
Industry	Scenario	2018	2023	2027	2040
All industries	Current law	21.18	23.53	22.95	21.93
	TCJA	9.16	17.33	18.88	16.06
Retail trade	Current law	27.49	30.28	29.68	28.82
	TCJA	15.58	22.18	22.96	20.25
Wholesale trade	Current law	25.90	28.68	28.09	27.21
	TCJA	14.45	20.60	21.31	18.41
Agriculture, forestry, fishing, and hunting	Current law	30.06	33.27	32.71	32.01
	TCJA	16.72	24.46	25.36	22.47

# Dynamic Effects: More Results

Year	GDP (% change)		Labor Services (% change)		Capital Services (% change)	
	High return to capital	Low return to capital	High return to capital	Low return to capital	High return to capital	Low return to capital
2027	1.1%	0.6%	0.3%	0.4%	2.4%	0.8%
2040	1.6%	0.7%	0.2%	0.3%	4.5%	1.3%

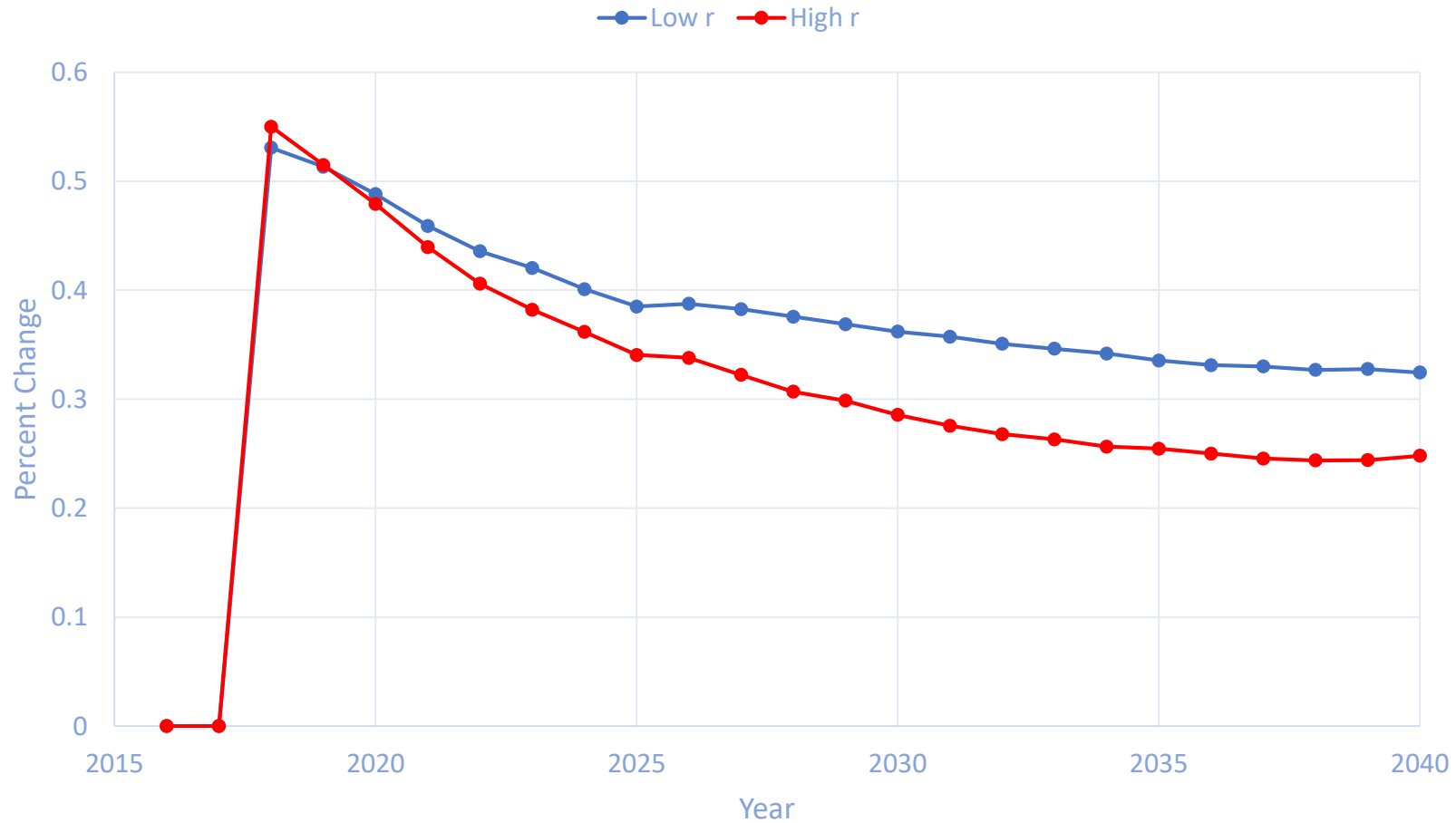
# Federal Debt

## Percent Change from Current Law



# Hours Worked

## Percent Change from Current Law





## Effects of Extending the Changes to Individual Taxes in the TCJA on Revenue and Debt Relative to Current Policy

Years	Cumulative Revenue (billions of \$)			Change in Debt (billions of \$)		
	Static	Dynamic		Static	Dynamic	
		High return to capital	Low return to capital		High return to capital	Low return to capital
2018-2027	-\$394	-\$407	-\$389	\$439	\$736	\$573
2018-2040	-\$3,556	-\$3,968	-\$3,772	\$4,793	\$6,054	\$5,245

*Negative dynamic score: very little marginal effects on individual side coming from extensions.*