On Financing Retirement with an Aging Population

Ellen R. McGrattan and Edward C. Prescott

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Codes and data at www.econ.umn.edu/~erm

A Policy Challenge

- Financing Social Security and Medicare with
  - Populations aging
  - Costs per retiree rising
- U.S. system relies on heavily taxing workers' incomes
- Is there a better system?

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A Better System

- Mandatory savings-for-retirement system
- Lower distortionary taxes than with PAYGO
- Devise a transition with:
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    - All birth-cohorts and income groups better off
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- How possible?

How Possible?

- During transition:
  - Phase out payroll taxes faster than SS and Medicare
  - Suspend deductibility of benefits
  - Flatten labor tax schedule

- Which, in turn:
  - Protects retirees who don't gain from lower taxes
  - Provides resources to finance transition
  - Achieves efficiency gains

Quantitative Innovations

- *All productive capital* included in analysis
  - Fixed assets reported pre-2013 by BEA
  - Land
  - Inventories
  - Intangible assets (eg. patents, trademarks)
- Model matches macro *aggregates* and micro *distributions*
  - Macro: National accounts (BEA)
  - Micro: Tax returns and household surveys (IRS,CPS)

Outline

- Theory
- Macro data
- Micro data
- Results

Theory

Model Economy

- Discrete time, $t = 0, 1, \ldots$
- Households in OLG structure
  - Ages $j = 1, \ldots, J$
  - Productivity levels $k = 1, \ldots, K$
- Businesses of two types:
  - Schedule C corporations (Sector 1)
  - All other business (Sector 2)
- Government summarized by fiscal policies

Household Problem (age j, productivity k)

- Choose assets a', consumption c, labor ℓ:

$$v_j(a,s,k) = \max_{a',c,\ell} \left\{ u(c,\ell) + \beta\, \sigma_t^j v_{j+1}(a',s',k) \right\}$$

$$\begin{aligned} \text{s.t.} \quad & (1+\tau_{ct})c + \sigma_t^j a' = (1+i_t)a + y_t - T_t^j(y_t) \\ & y_t = w_t \ell \epsilon^k \\ & s' = F(s) \end{aligned}$$

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& y_t = w_t \ell \epsilon^k \\
& s' = F(s)
\end{aligned}
$$

  taking as given ...

  - prices $\{i_t, w_t\}$
  - taxes and transfers $\{\tau_{ct}, T_t^j(\cdot), j = w, r\}$
  - survival probabilities $\{\sigma_t^j\}$
  - evolution of the aggregate state s, $F(s)$
  - age of retirement J_r, i.e., $\ell_t = 0$ if $j > J_r$

Technology

- Production technologies:
  - $Y_t = Y_{1t}^{\theta_1} Y_{2t}^{\theta_2}$ = composite final good
  - $Y_{it} = K_{iTt}^{\theta_{iT}} K_{iIt}^{\theta_{iI}} (\Omega_t L_{it})^{1-\theta_{iT}-\theta_{iI}}$, $i = 1, 2$
- Evolution of stocks and labor-augmenting technology
  - $K_{iT,t+1} = (1-\delta_{iT})K_{iTt} + X_{iTt}$ (Tangible)
  - $K_{iI,t+1} = (1-\delta_{iI})K_{iIt} + X_{iIt}$ (Intangible)
  - $\Omega_{t+1} = (1+\gamma)\Omega_t$

Government Policy

- Public consumption $G_t = \phi_{Gt}$ GNP
- Public debt $B_t \leq \phi_{Bt}$ GNP
- Net tax functions $\{T_t^w(y), T^r\}$ for workers, retirees
- Tax rates $\tau = \{\tau_{ct}, \tau_{d,it}, \tau_{\pi,1t}\}$, where
    - $c =$ consumption
    - $d =$ distribution
    - $\pi =$ profit

Government Budget Constraints

- Evolution of debt:

$$B_{t+1} = (1+i_t)B_t + G_t - \sum_{jk} n_t^{jk} T_t^j (w_t \ell_t^{jk} \epsilon^k)$$

$$- \tau_{ct} C_t - \tau_{\pi,1t}\Pi_{1t} - \sum_i \tau_{d,it} D_{it}$$

where profits and distributions are

$$\Pi_{1t} = p_{1t}Y_{1t} - w_t L_{1t} - \delta_{1T} K_{1Tt} - X_{1It}$$

$$D_{1t} = (1-\tau_{\pi,1t})\Pi_{1t} - K_{1T,t+1} + K_{1Tt}$$

$$D_{2t} = \Pi_{2t} = p_{2t}Y_{2t} - w_t L_{2t} - \delta_{2T} K_{2Tt} - X_{2It}$$

Equilibrium Conditions

- Labor, capital, and goods markets clear at each date
- Household policy functions $\{a' = f_j(s)\}_j$ imply $s' = F(s)$.
- Which implies:
  - Aggregate output: $Y = C + \sum_i (X_{iT} + X_{iI}) + G$
  - Aggregate assets: $A' = \sum_i V_i + B'$, or:

$$A' = \underbrace{(1-\tau_{d1})(K'_{1T} + (1-\tau_{\pi 1})K'_{1I})}_{V_1} + \underbrace{K'_{2T} + (1-\tau_{d2})K'_{2I}}_{V_2} + B'$$

Quantitative Innovations

Larger Productive Capital Stock

- Typical estimates are ≈ 3 GNPs:
    - Private fixed assets (2.2 GNPs)
    - Public fixed assets (0.6 GNPs)
    - Consumer durables (0.3 GNPs)
- But, other stocks help finance retirement:
    - Inventories (0.13 GNPs)
    - Land (0.89 GNPs)
    - Intangible capital (1.7 GNPs)

$\Rightarrow$ about 5.8 GNPs <u>currently</u> available

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$\Rightarrow$ about 5.8 GNPs <u>currently</u> available

Fit Macro Data

- Data: NIPA and Fixed Asset Tables, 2000–2010
- Parameters of:
  - Preferences ($u(\cdot), \beta$)
  - Technologies (θ's,δ's)
  - Capital tax policy ($\tau_{di}, \tau_{\pi 1}$)
  - Government spending and debt (ϕ_G, ϕ_B)

Chosen so model matches NIPA/FA data and labor input

Accounts and Factor Inputs, Avg 2000–2010

	Model	Data
Total Income $(Y - X_I)$	1.00	1.00
Labor Income (wL)	.59	.59
Capital Income $(Y - wL - X_I)$	.42	.42
Total Product $(C + G + X_T)$	1.00	1.00
Consumption (C)	.75	.75
Tangible investment (X_T)	.21	.21
C-corporations (X_{1T})	.07	.07
Other business (X_{2T})	.14	.14
Defense spending (G)	.04	.04
Labor Input (L)	.28	.28
Capital Stock (K')	5.84	5.84
Tangible capital (K'_T)	4.12	4.12
C-corporations (K'_{1T})	.89	.89
Other business (K'_{2T})	3.23	3.23
Intangible capital (K'_I)	1.72	1.72

Fit Micro Data

- Data:
  - Current population survey (CPS)
  - Statistics of income (IRS)

- Parameters governing:
  - Productivity levels (ϵ^k)
  - Labor net taxes ($T^w(y)$)
  - Retiree transfers (T^r)

Chosen so model matches CPS and IRS distributions

Want to Aggregate CPS ⇒ BEA Incomes

- Group CPS persons into families
- Construct family data per person over 15
- Use IRS data for topcoded incomes
- Use CPS distributions and inflate to BEA totals
- Use auxiliary data for missing income categories

Want to Aggregate CPS ⇒ BEA Incomes

More money incomes ⇒

Per Capita Family AGI	Tax Filers	Deps. < 15	Deps. > 15	Total	W& Sal.	Self-Emp.	Cap. Inc.	Soc. Sec.	. . . .
Nonfilers	0.0	4.4	29.8	261	8	0	13	174	
Filers:									
No AGI	4.6	0.7	0.7	60	9	−1	5	30	
1-10K	19.4	8.3	8.0	250	141	15	7	43	
10-20K	40.7	13.4	7.8	835	606	43	23	68	
20-30K	36.9	11.3	3.8	1062	866	53	31	37	
30-40K	25.8	7.7	1.6	965	799	44	33	26	
40-50K	17.2	5.4	1.0	812	689	36	34	13	
50-100K	24.1	7.2	1.1	1612	1328	83	98	27	
100-200K	5.6	1.7	0.2	690	560	46	54	8	
200-500K	1.3	0.5	0.1	299	258	24	13	1	
500K+	0.3	0.1	0.0	101	88	7	5	0	
Total	176.2	60.7	54.2	6948	5351	350	313	426	1

Want to Aggregate CPS ⇒ BEA Incomes

More personal incomes ⇒

Per Capita Family AGI	Tax Filers:	Deps.			Incomes			T
		< 15	> 15	Total	W&S	Prop.	Cap.	SS
Nonfilers	0.0	4.4	29.8	773	8	0	19	198
Filers:								
No AGI	4.6	0.7	0.7	129	9	−3	8	34
5-10K	19.4	8.3	8.0	631	139	36	11	49
10-20K	40.7	13.4	7.8	1498	599	100	34	78
20-30K	36.9	11.3	3.8	1691	856	124	46	41
30-40K	25.8	7.7	1.6	1440	790	104	51	29
40-50K	17.2	5.4	1.0	1174	681	84	52	15
50-100K	24.1	7.2	1.1	2224	1313	197	149	30
100-200K	5.6	1.7	0.2	905	553	110	83	9
200-500K	1.3	0.5	0.1	382	255	57	19	1
500K+	0.3	0.1	0.0	125	87	17	7	0
Unassigned	0.0	0.0	0.0	1263	103	84	1076	0
Total	176.2	60.7	54.2	12233	5392	911	1555	485

Productivity Levels

- Baseline parameterization: 4 productivity levels
- Implied AGIs at transition start:
  - \$0 to 15,000 (No to low income, 38%)
  - 15,0000 to 40,000 (Middle income, 40%)
  - 40,0000 to 200,000 (High income, 21%)
  - Over 200,0000 (One-percenters, 1%)

  in 2004 \$ per family member over 15

Modeling Net Tax Function

- Workers face piecewise linear function:

$$
\begin{aligned}
T^w(y) &= T_i(y) - \Psi_i^w \quad \text{if } y \in [\underline{y}_i, \bar{y}_i] \\
&\simeq \underbrace{T_i'(\bar{y})}_{\text{marginal}} \; y - \{ \underbrace{[T_i'(\bar{y}) - T_i(\bar{y})/\bar{y}]}_{\text{marginal less average}} \bar{y} + \underbrace{\Psi_i^w}_{\text{NIPA+}} \} \\
&\equiv \beta_i y + \alpha_i
\end{aligned}
$$

- Retirees get constant amount T^r $(= \$32{,}526$ in 2004)

- NOTE: *All families face same tax/transfer schedules*

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$$\simeq \underbrace{T_i'(\bar{y})}_{\text{marginal}}\ y - \{\underbrace{[T_i'(\bar{y}) - T_i(\bar{y})/\bar{y}]\ \bar{y}}_{\equiv\text{residual}} + \underbrace{\Psi_i^w}_{\text{NIPA+}}\}$$

$$\equiv \beta_i y + \alpha_i$$

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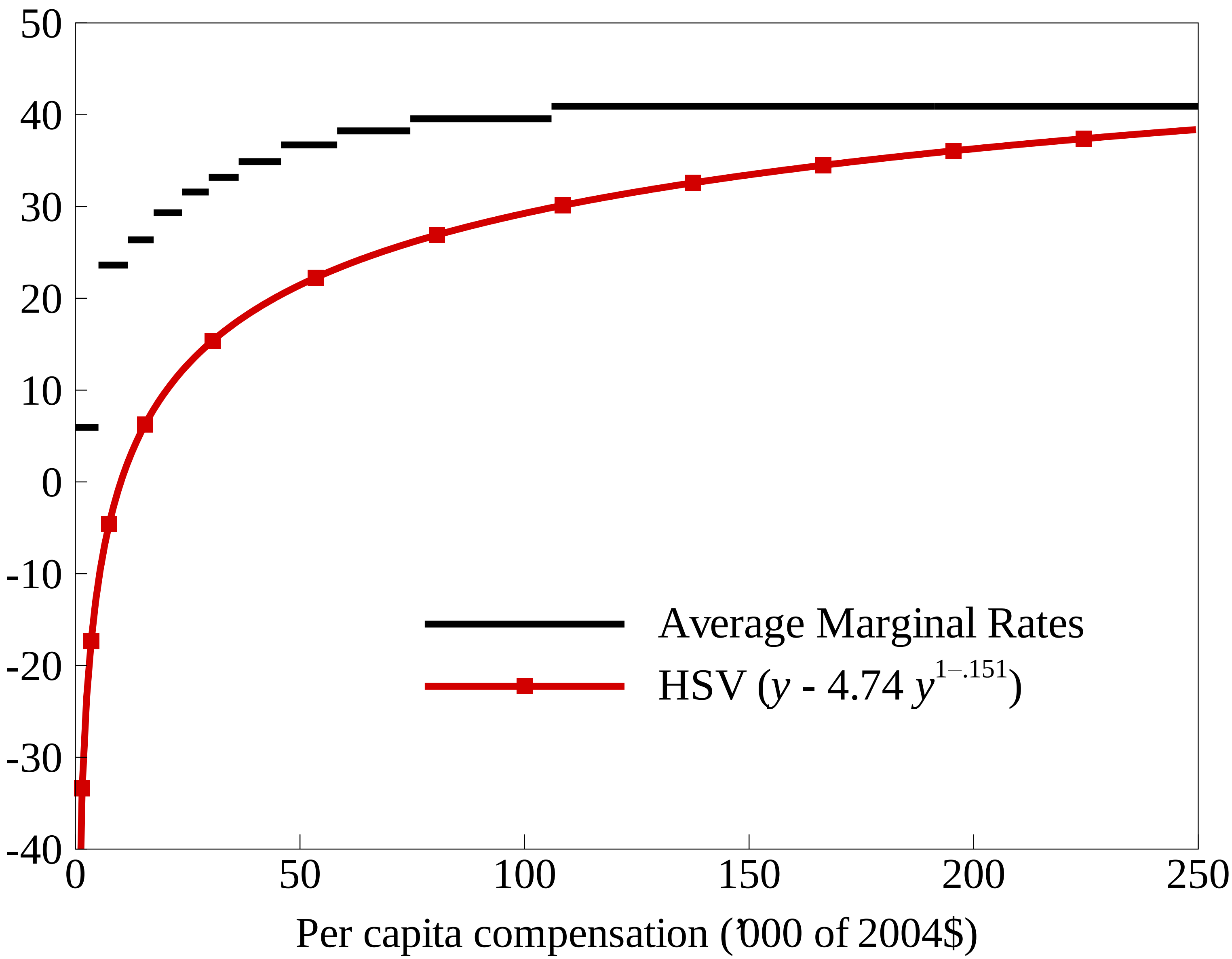
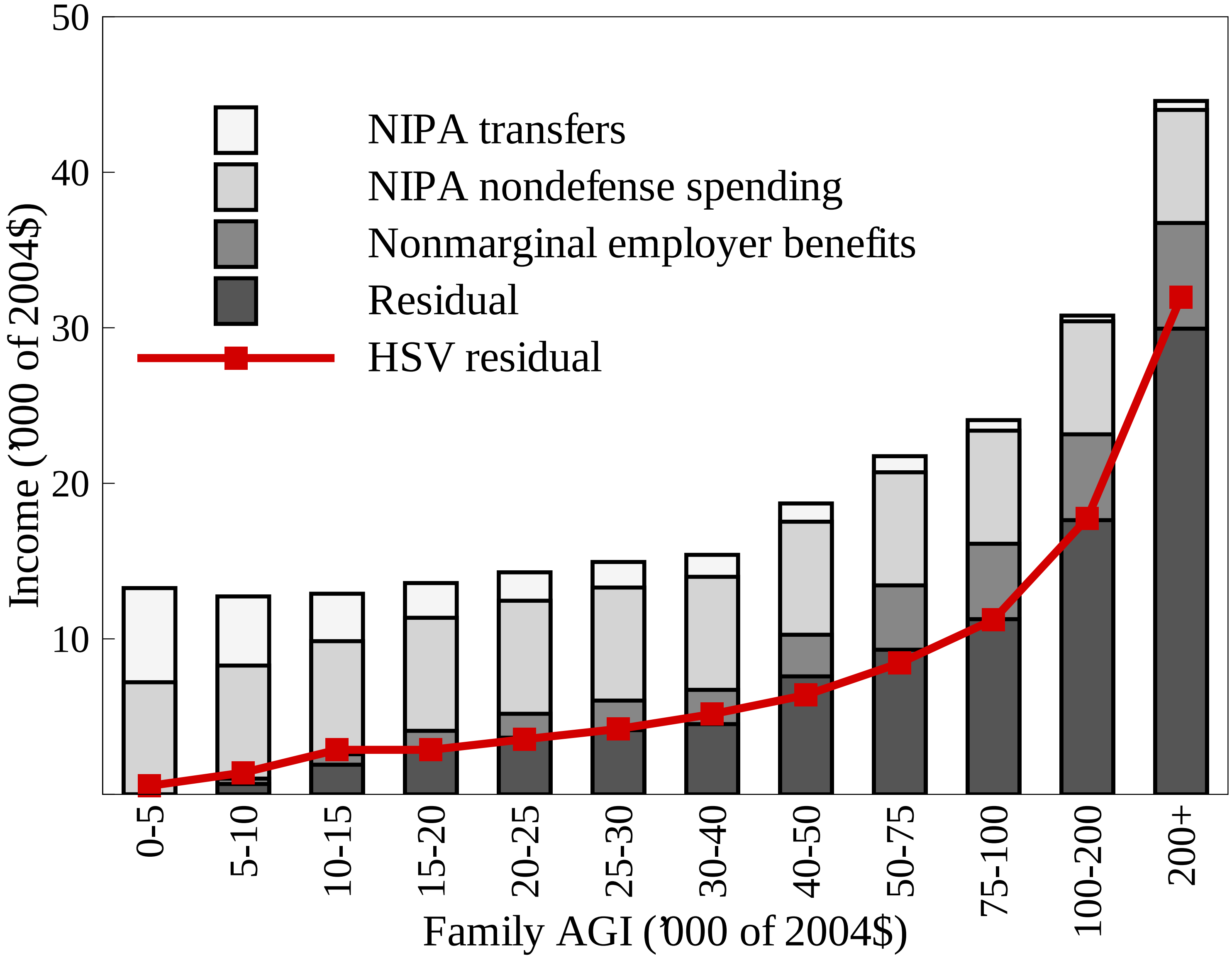
- NOTE: *All families face same tax/transfer schedules*

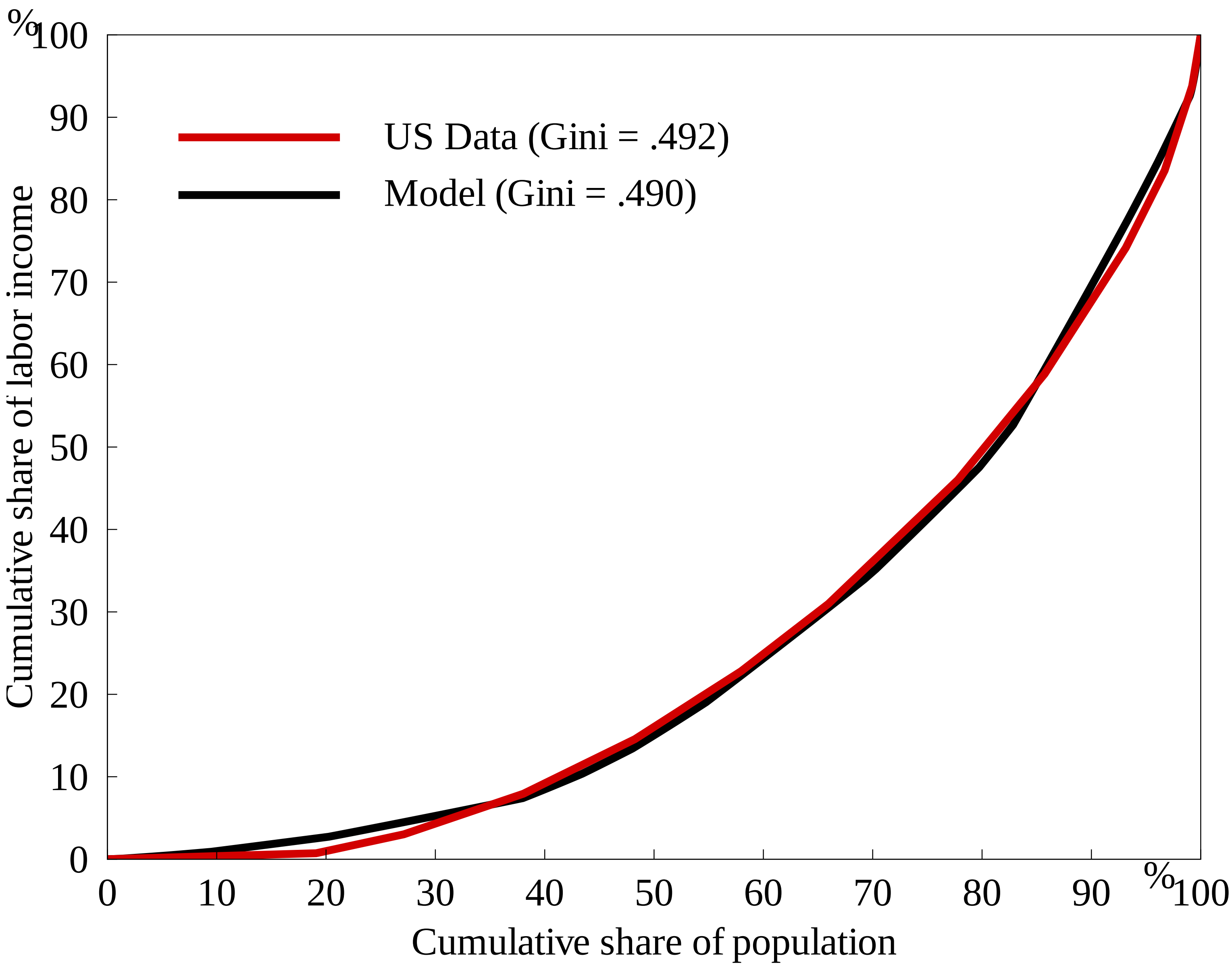
Average Marginal Tax Rates



Nonmarginal Components of $T^w(y)$



Gini Index for Pre-Tax Labor Income, 2004



Policy Experiments

Benchmark: Continued US Policy

- Demographic transition
  - 2010: 4 workers per retiree
  - 2110: 2.4 workers per retiree
- Policy transition
  - Net tax functions unchanged
  - Taxes on consumption meet revenue needs

Policy Reforms

- Start with initial assets from baseline economy
- Hold as constant fraction of GNP:
  - Government purchases of goods and services
  - Non-retirement transfers
- In steps, compare reforms to continued US policy
  - Gradually phase out FICA taxes/transfers
  - Phase out FICA taxes faster than transfers
  - Modify workers' net tax function (broaden & flatten)
  - Lower capital income taxes & introduce new transfers

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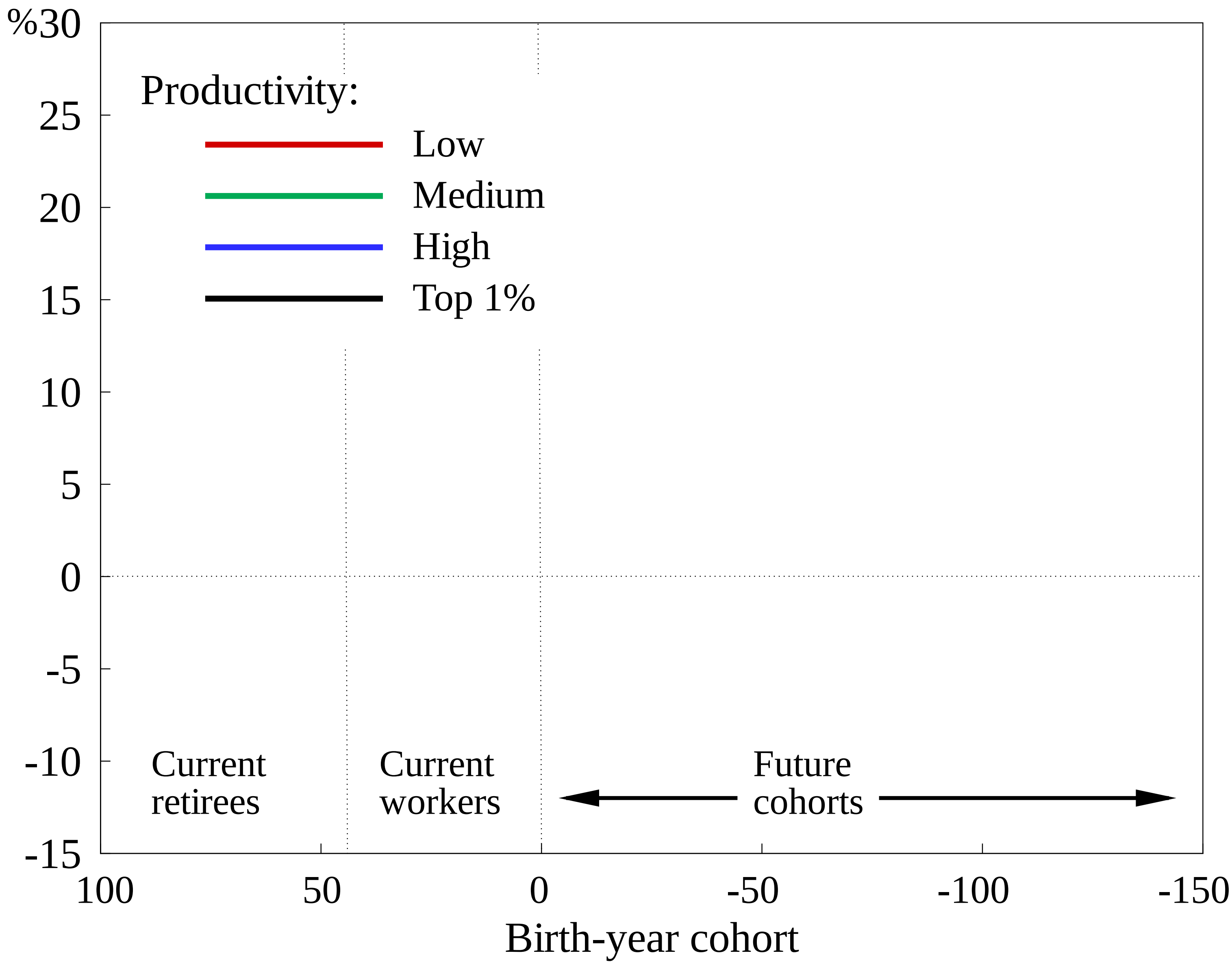
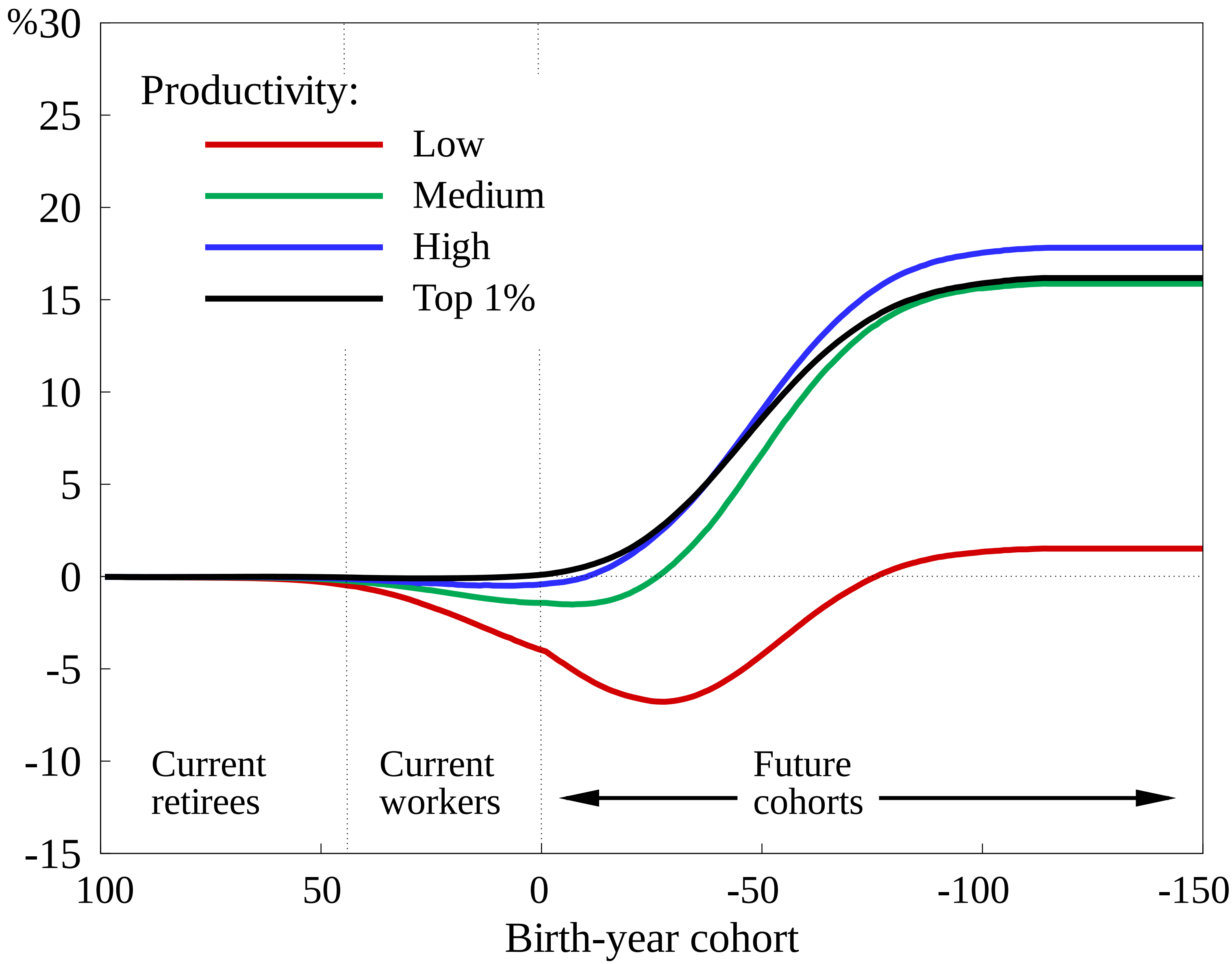
Welfare Results



Welfare: Phase out FICA Taxes & Transfers



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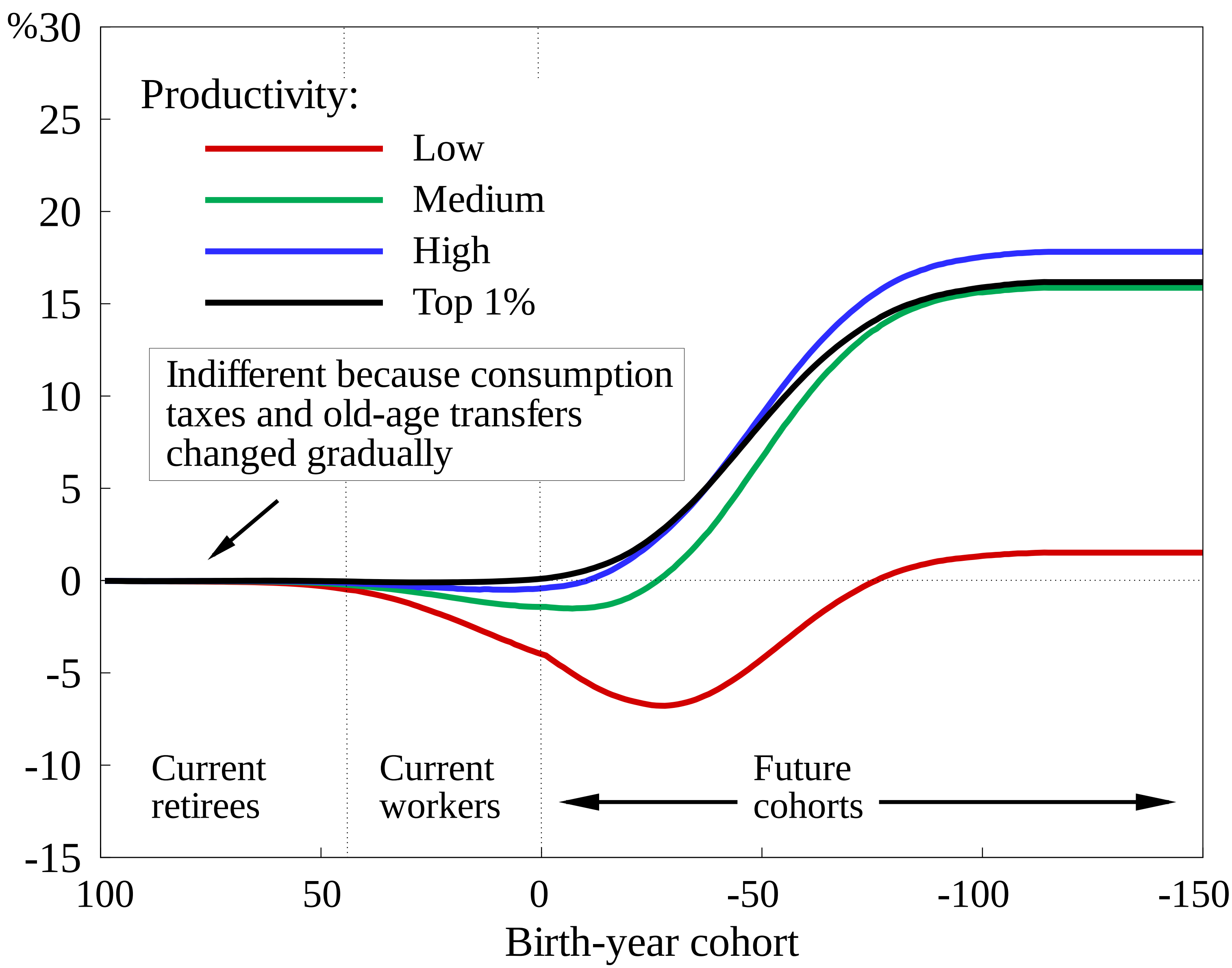

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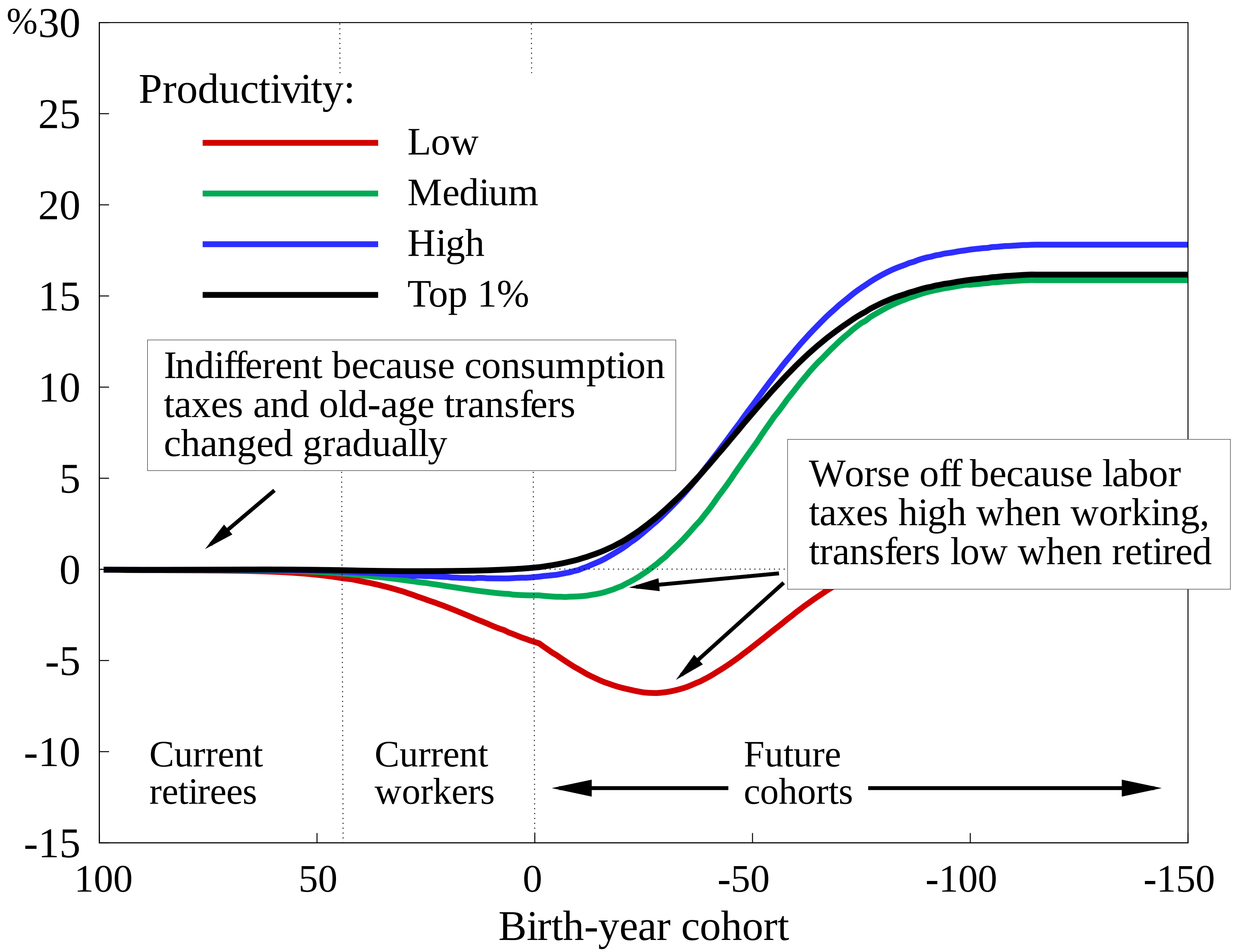
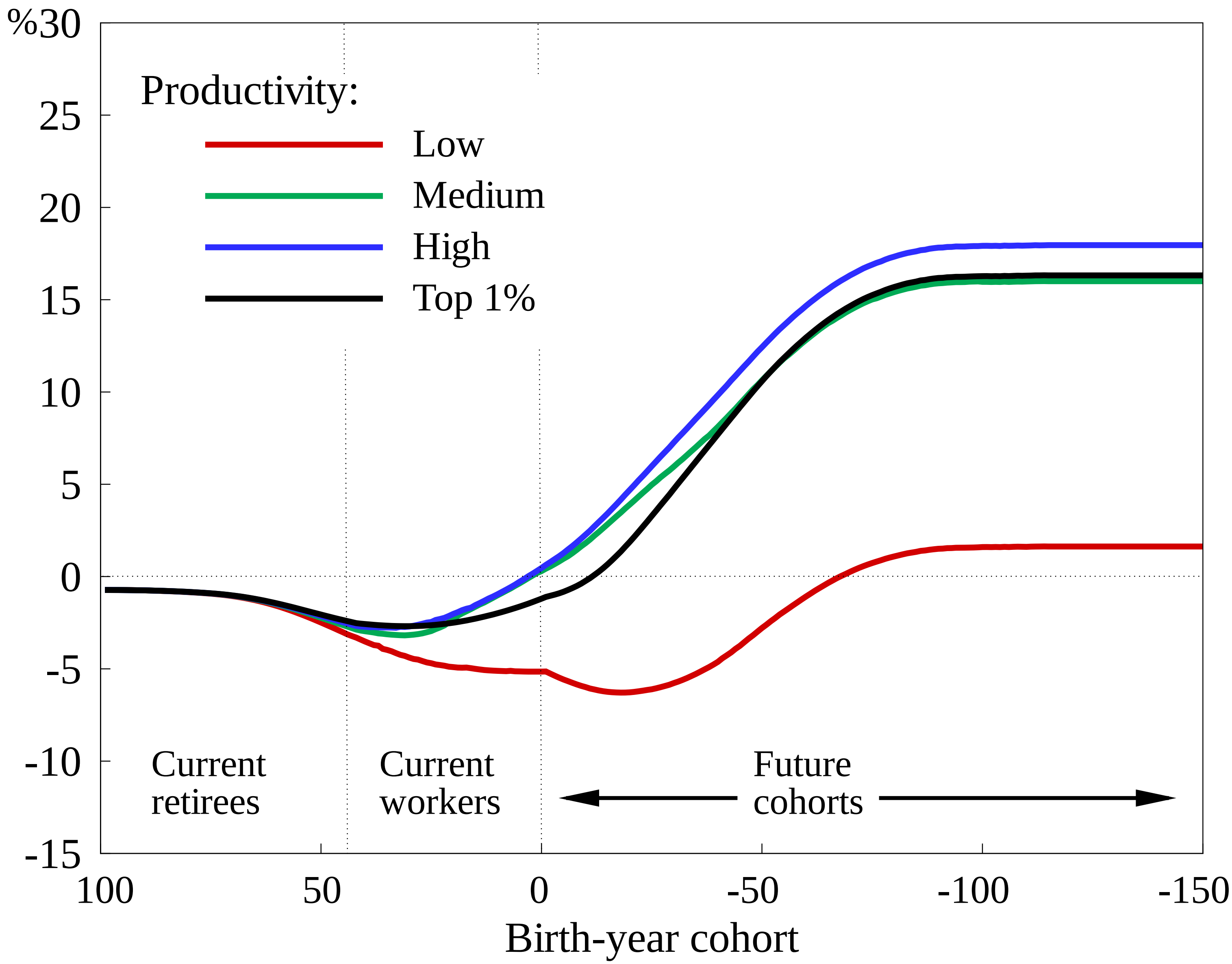


Welfare: Phase out FICA Taxes Faster



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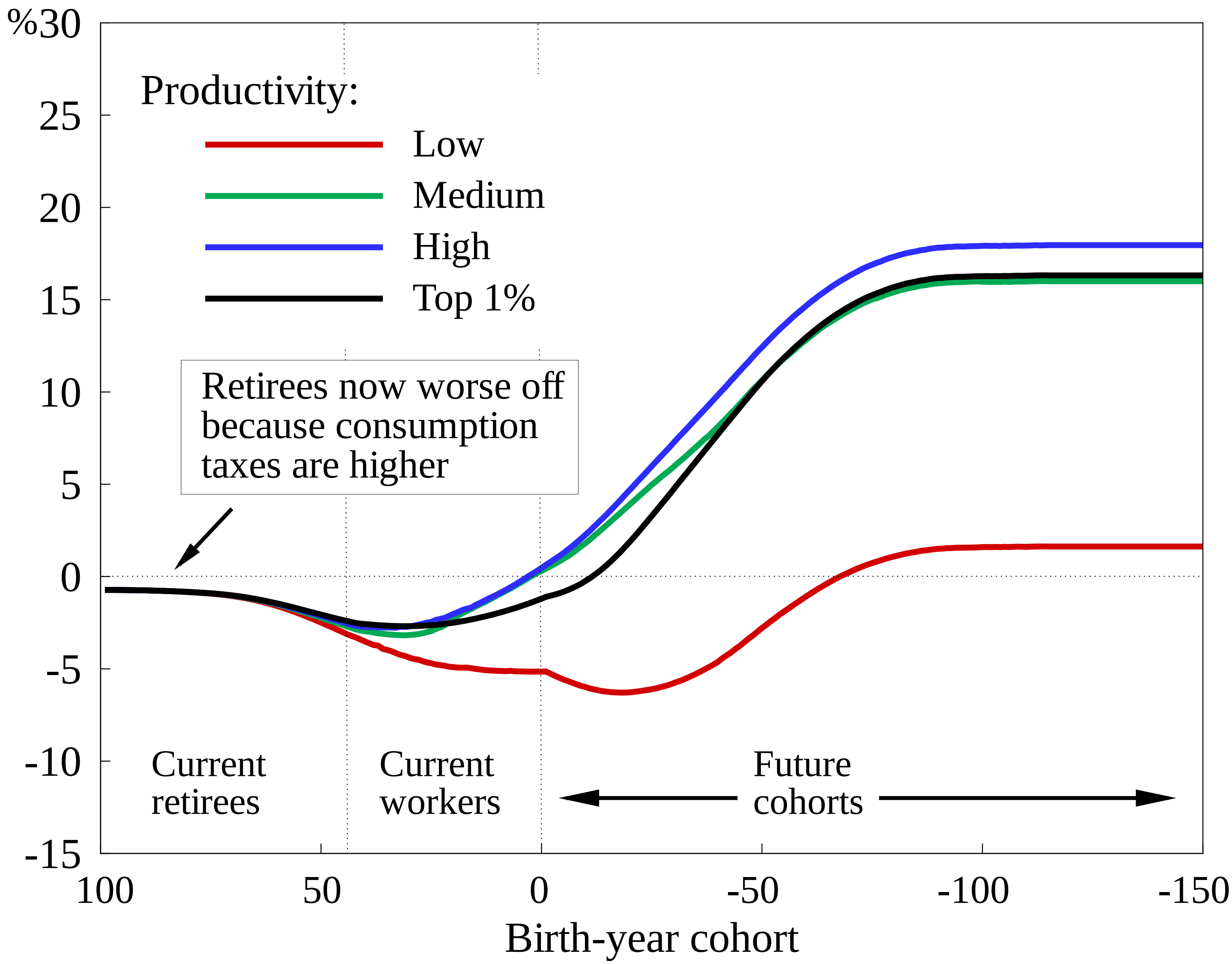

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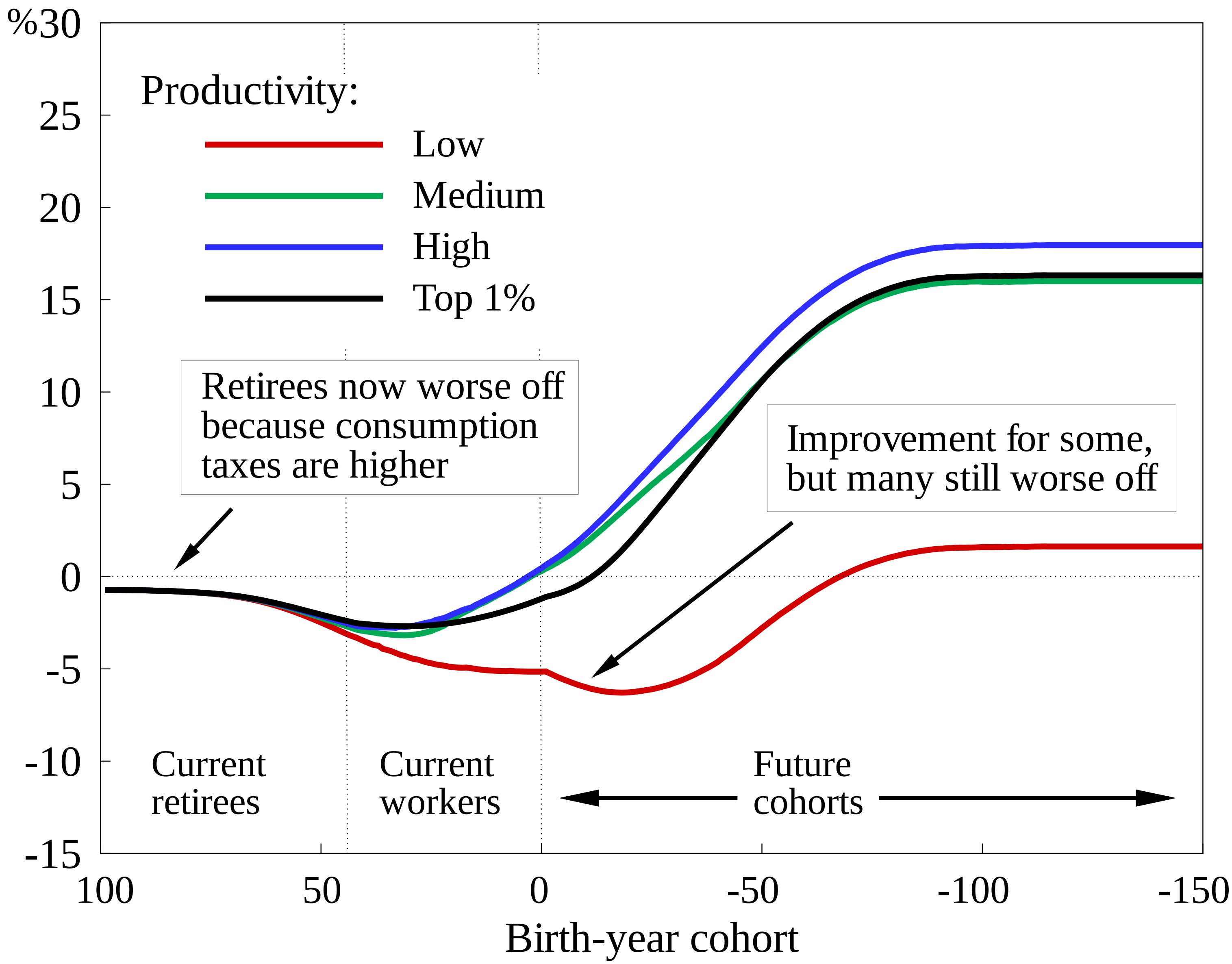
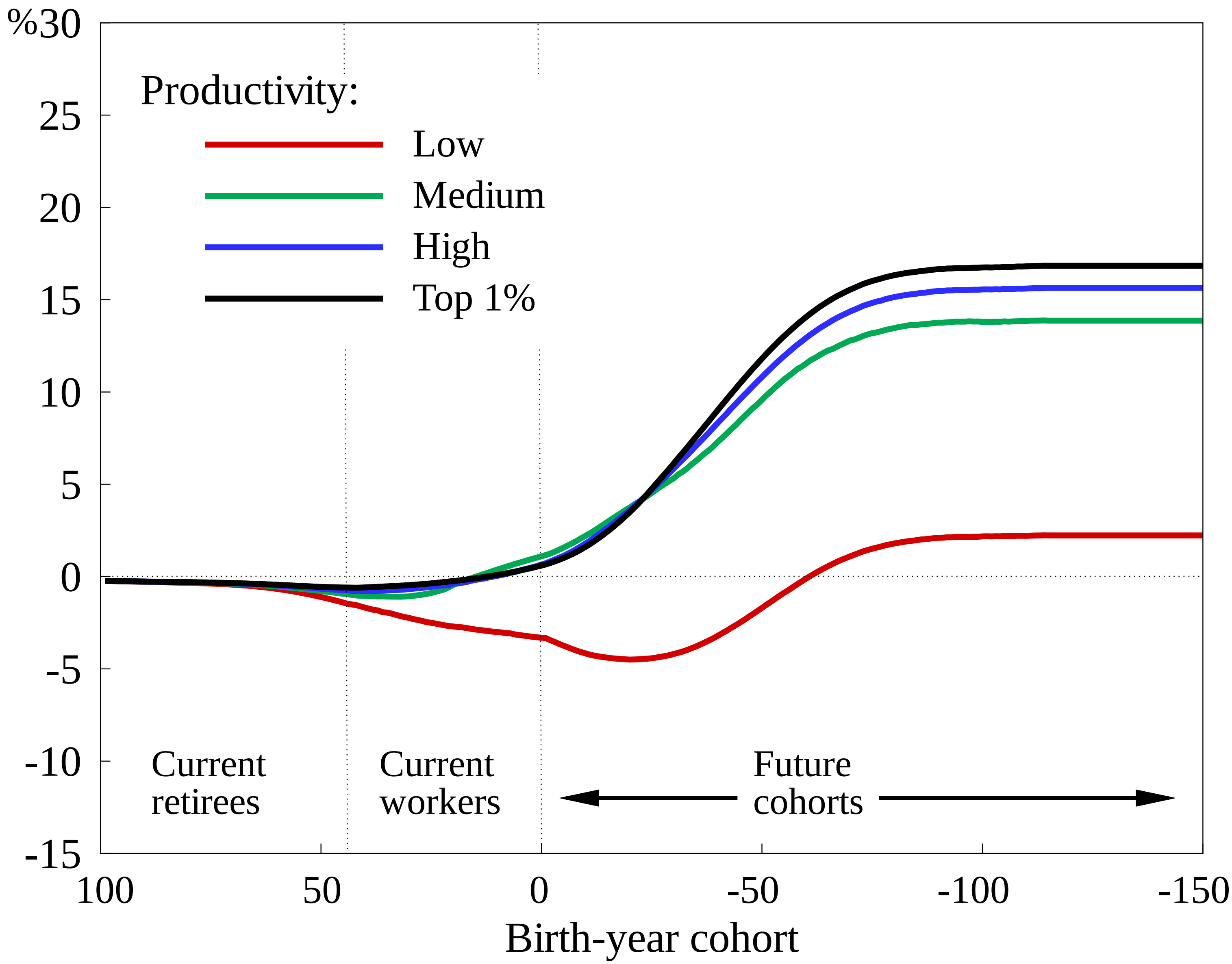


Welfare: Suspend Deductibility of Benefits



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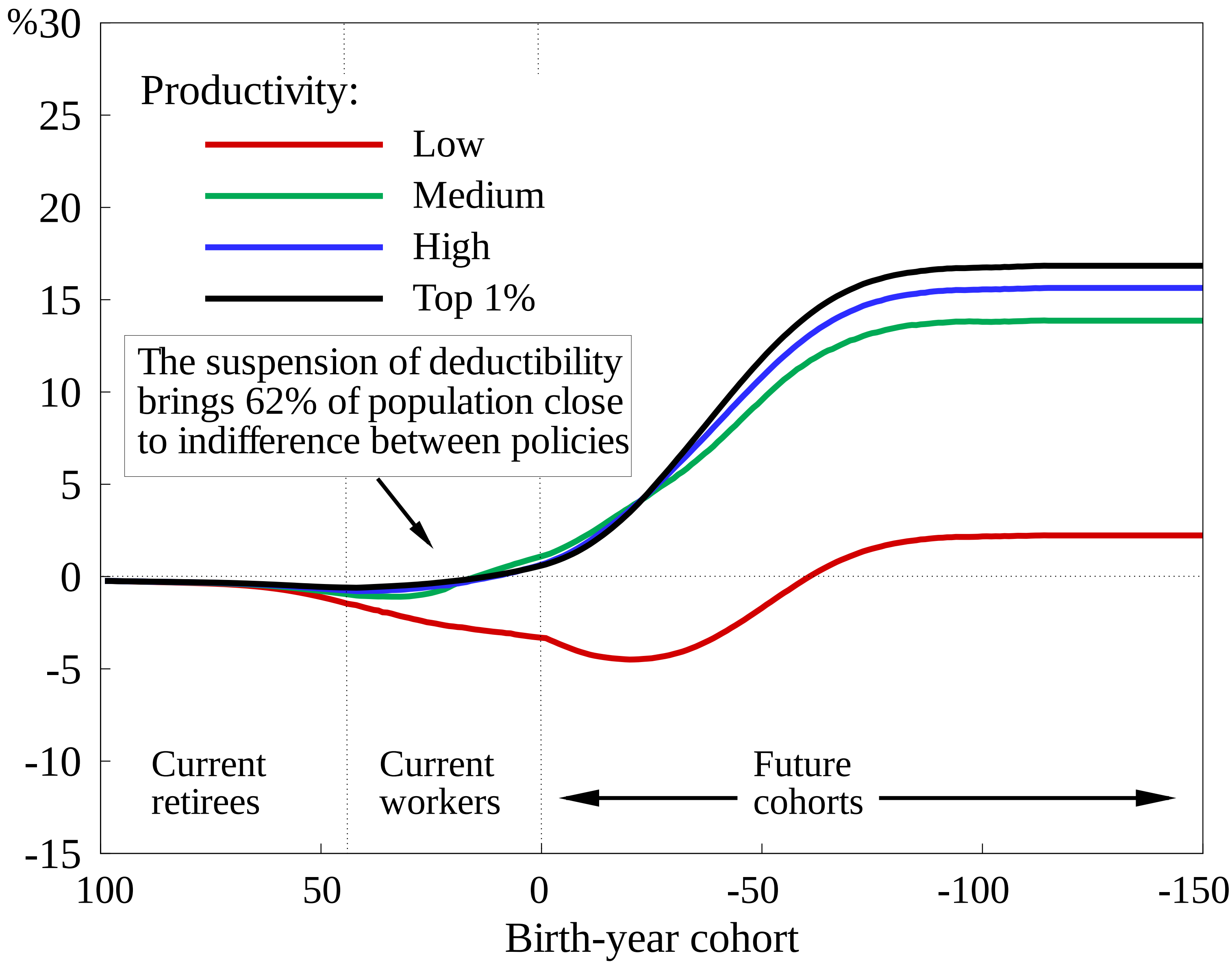

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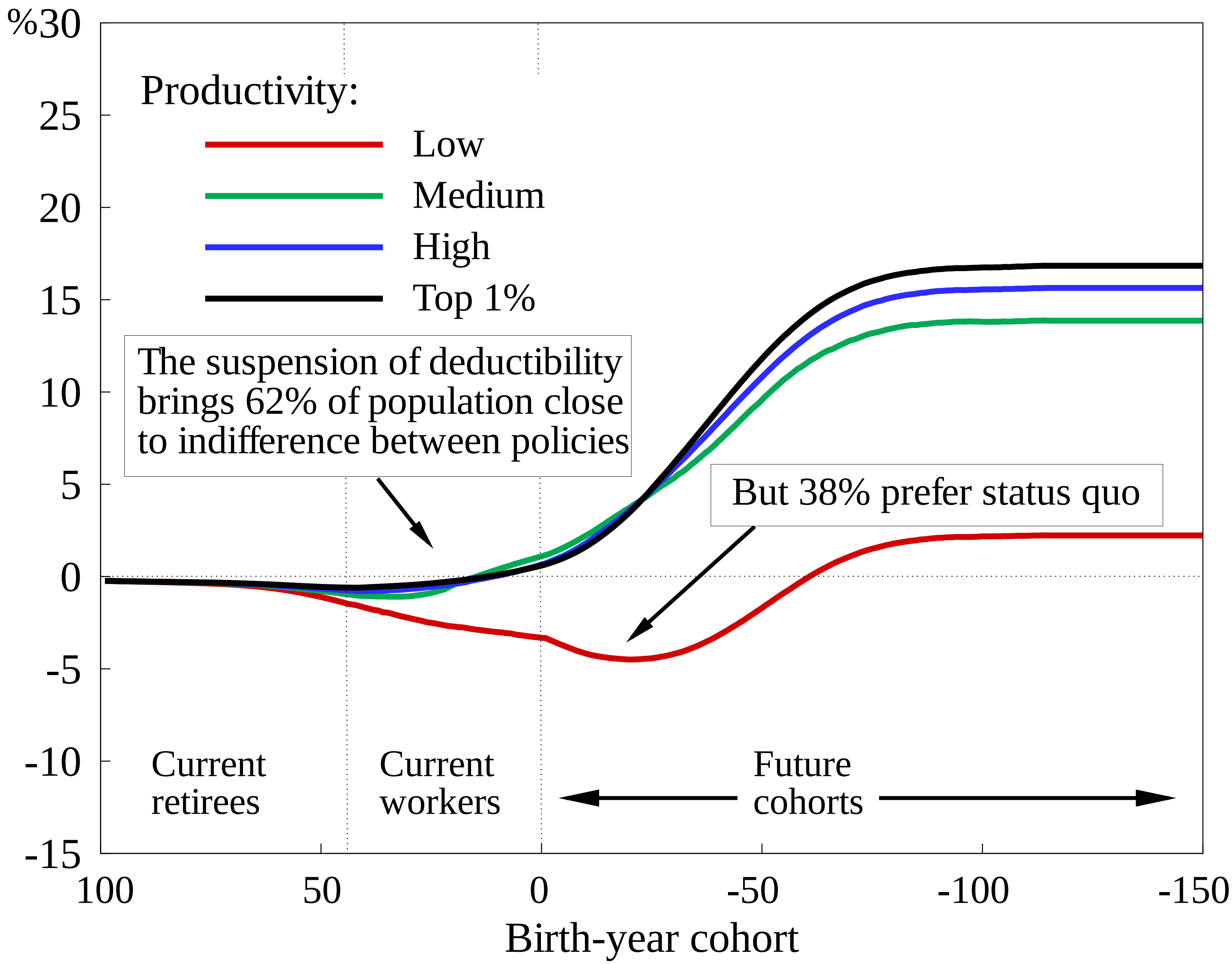
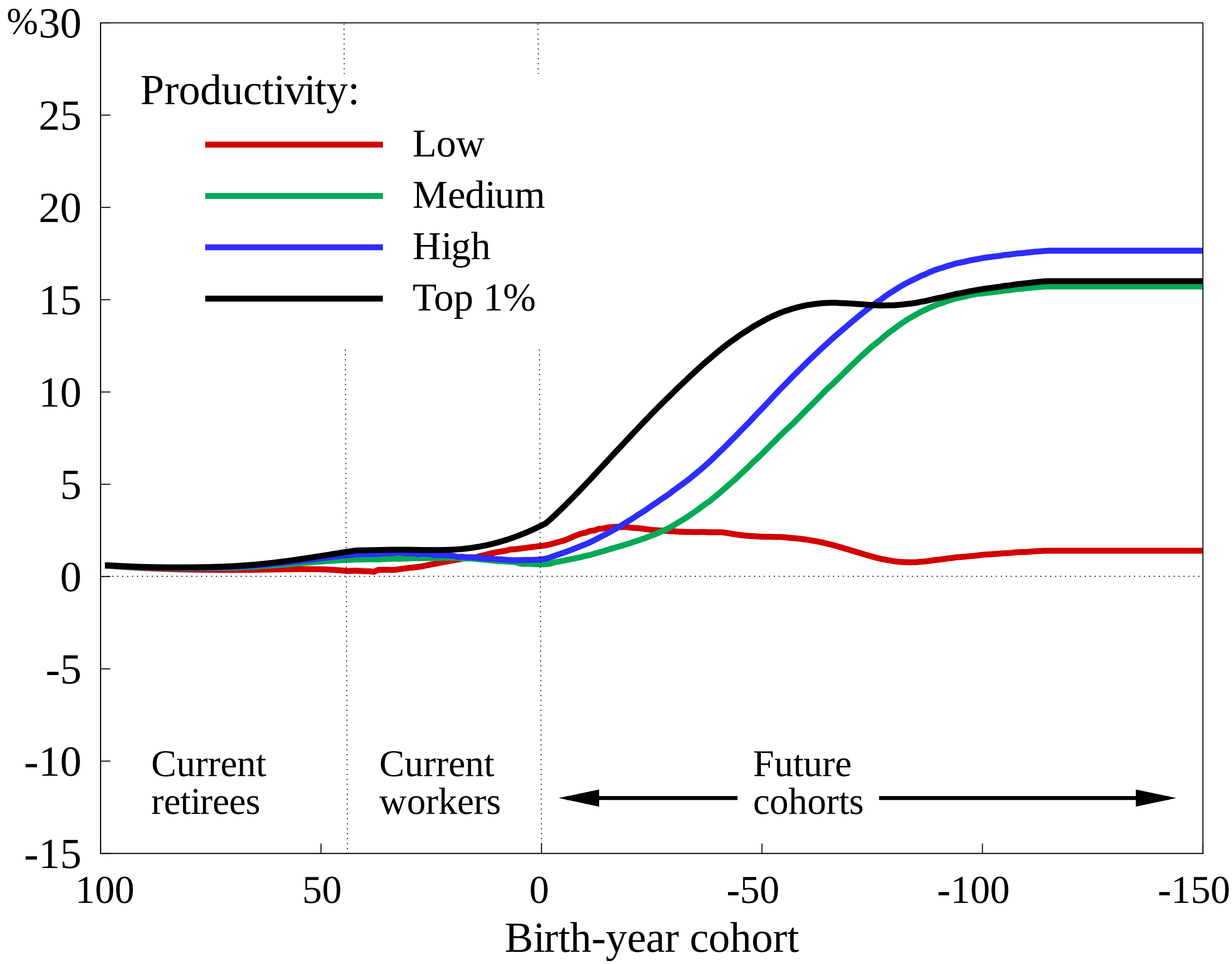


Welfare: Flatten Tax Schedule Temporarily



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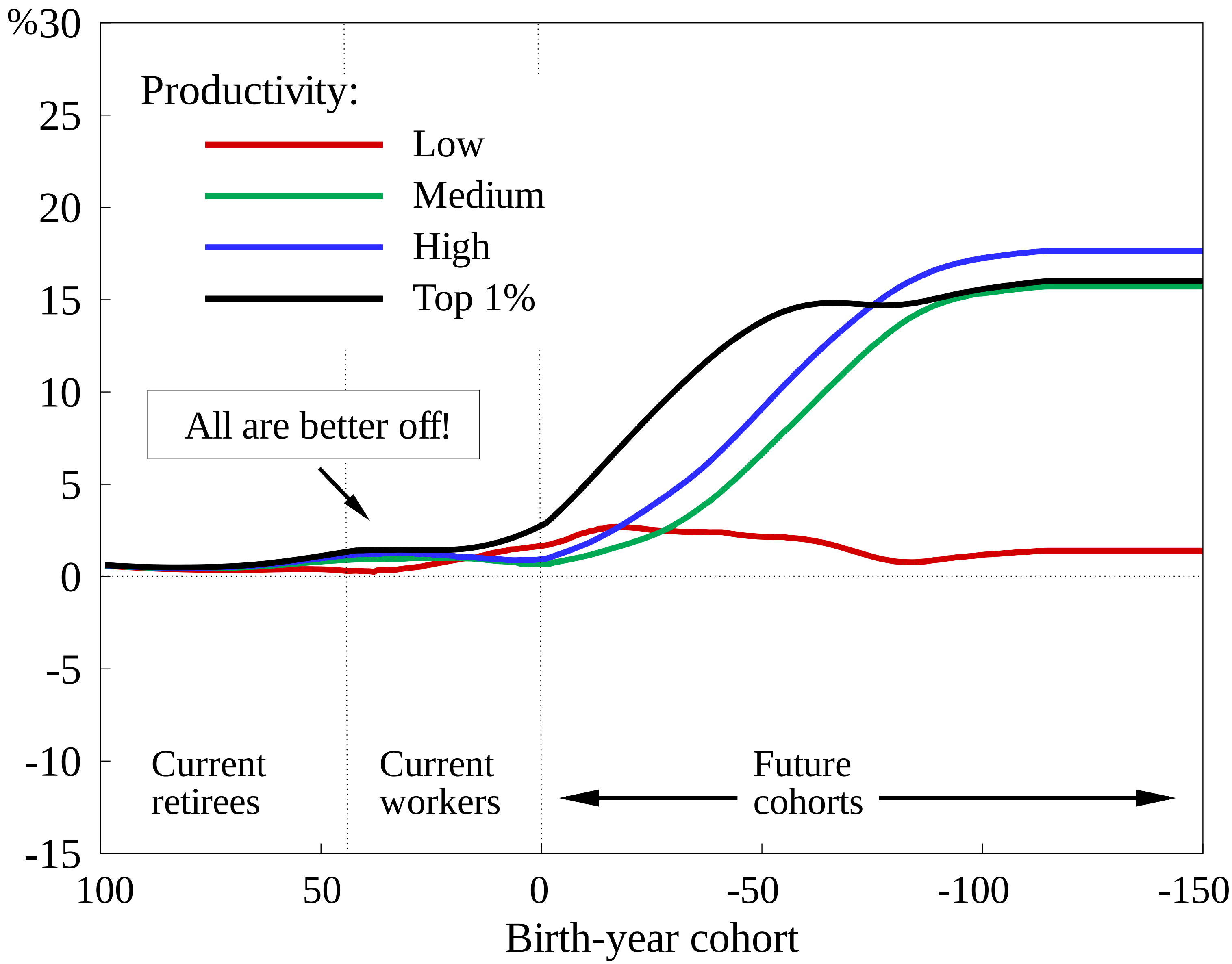

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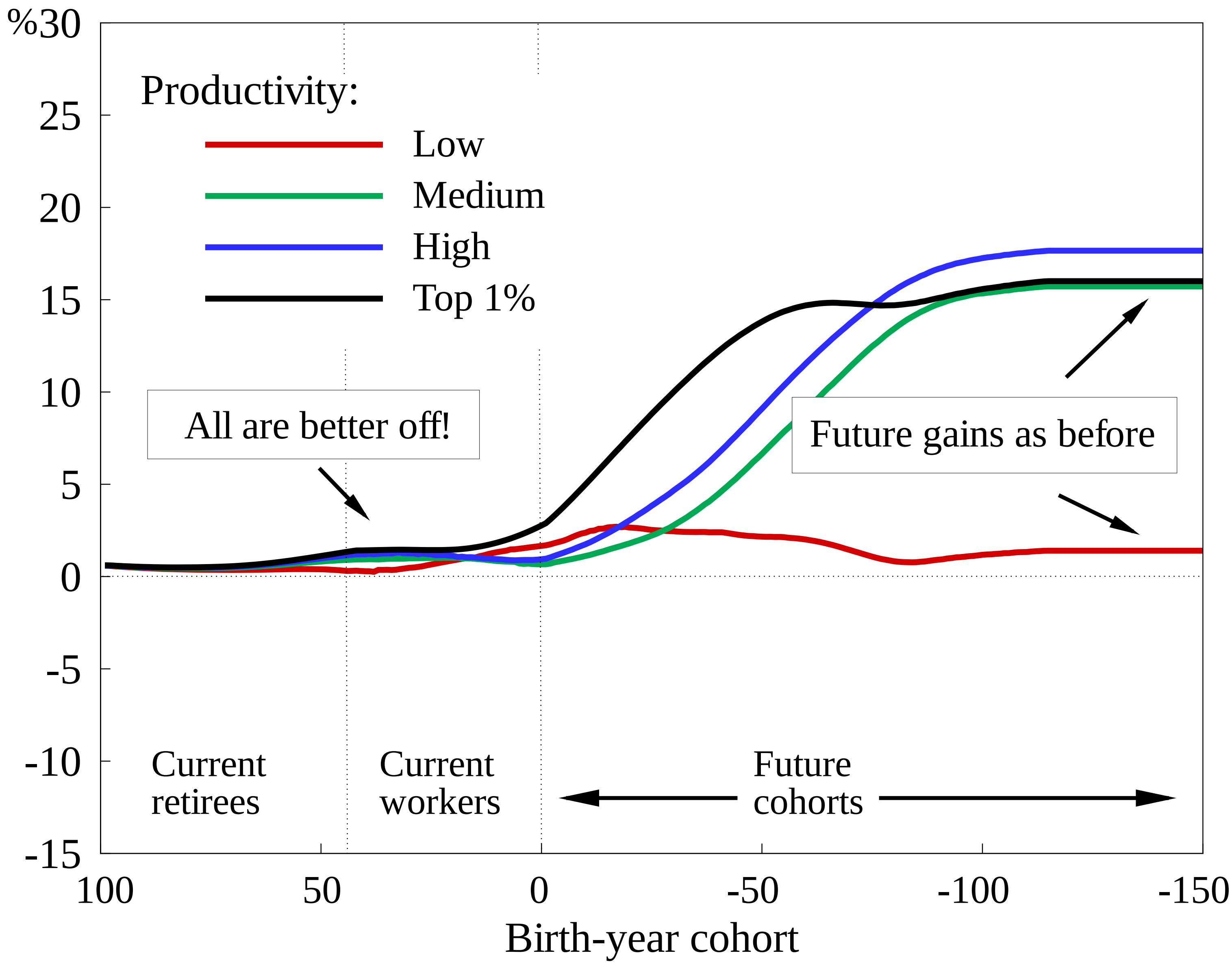
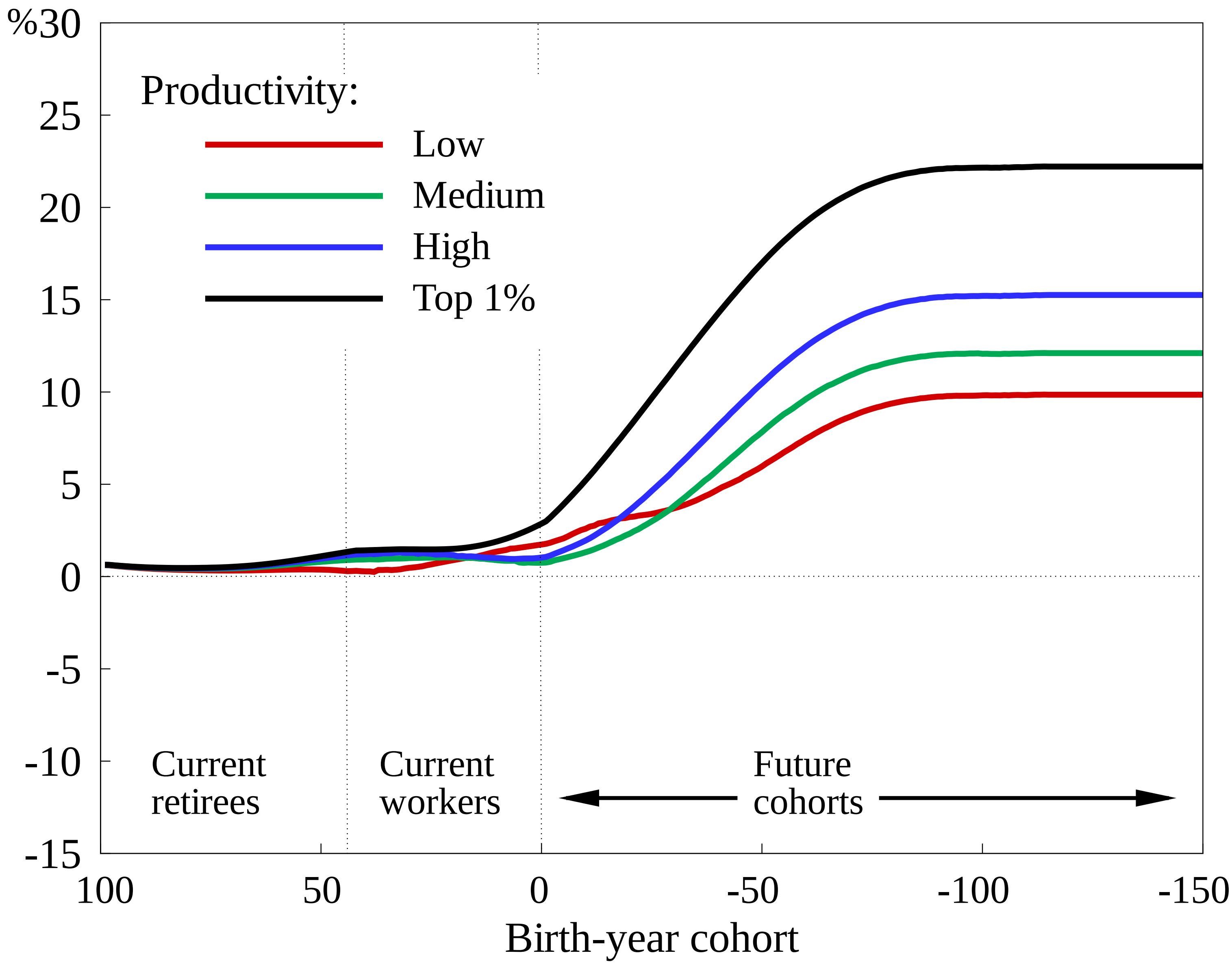


Welfare: Flatten Tax Schedule Permanently



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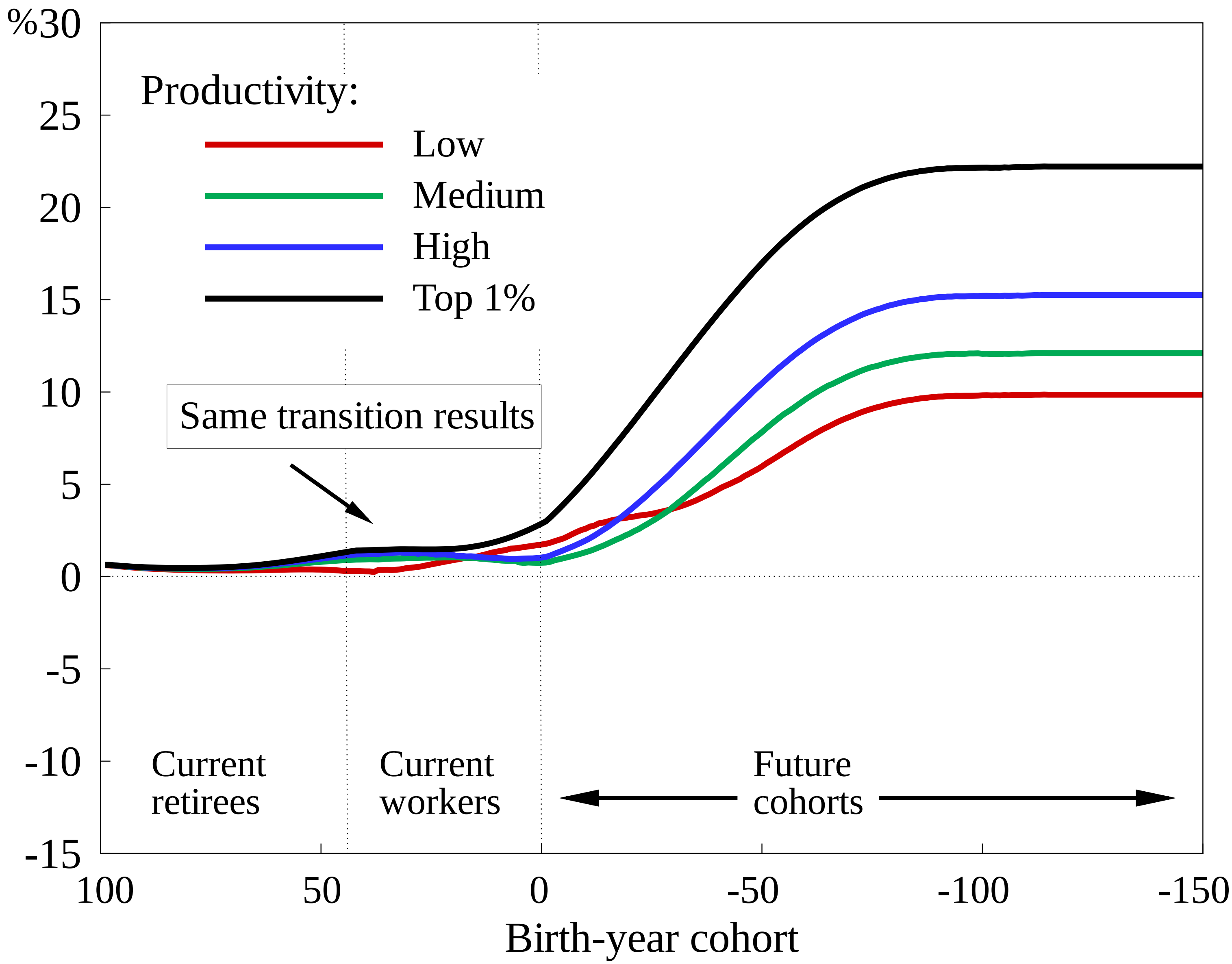

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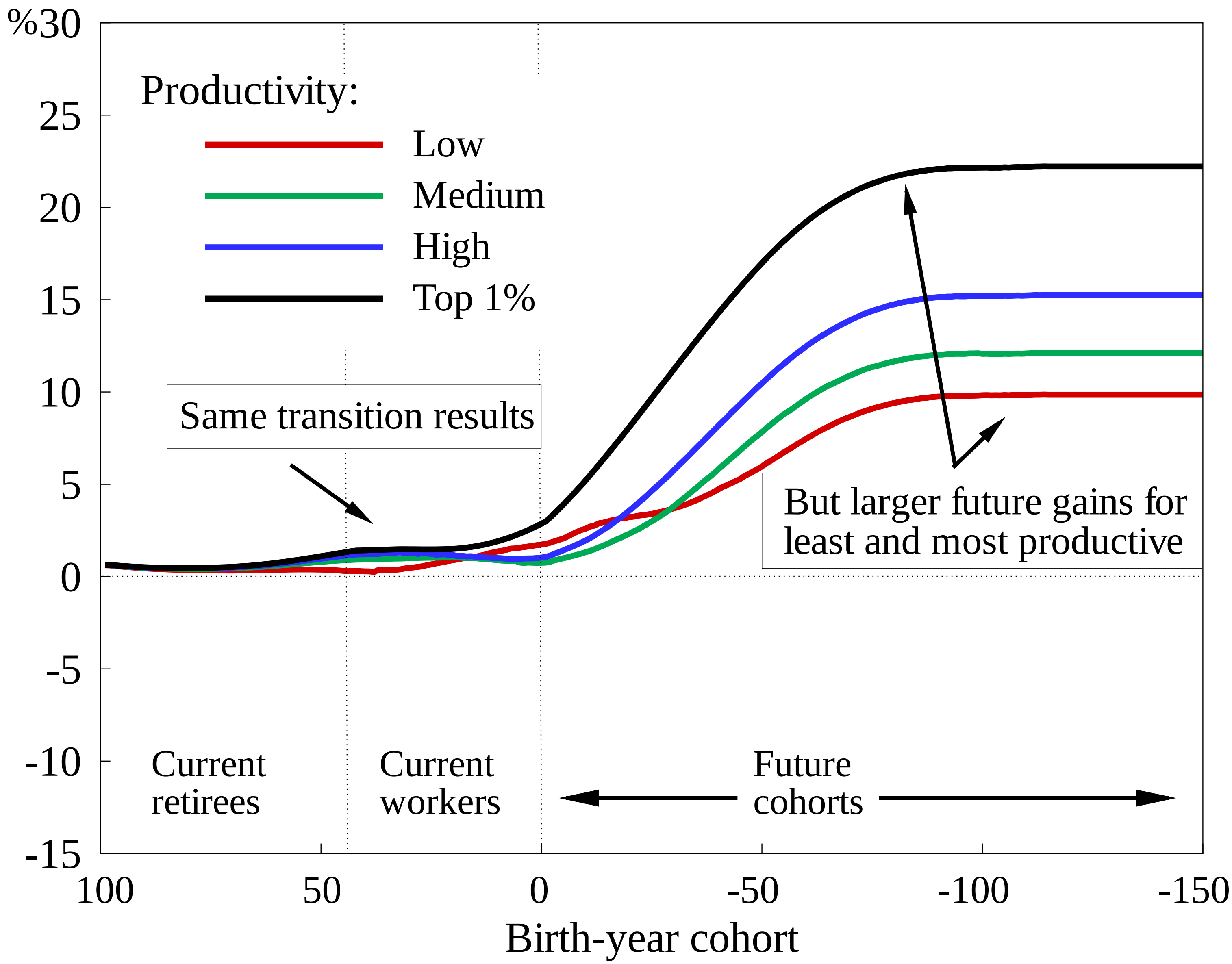


%Δ in GNP and Net Worth (Rel. to Trend)

	GNP	Net Worth
(1) Continue current policy	-5	-3
(2) Eliminate FICA, Medicare, SS	11	24
(3) And, broaden & flatten $T^w(y)$	16	25
(2) & (3) and phase out capital taxes	33	88
(2) & (3) and phase in new transfers	13	22

- Switching implies large increases in GNP and net worth

Gini Indices for Labor Income

	Before Taxes & Transfers	After Taxes & Transfers
(1) Continue current policy	.504	.362
(2) Eliminate FICA, Medicare, SS	.456	.339
(3) And, broaden & flatten $T^w(y)$	.471	.339
(2) & (3) and phase out capital taxes	.475	.353
(2) & (3) and phase in new transfers	.492	.318

- Switching implies a significant reduction in the Gini index

Are the results sensitive to...

- Varying age-dependent productivities?
- Including annuity markets?
- Including more productivity types?
- Lowering the labor elasticity?
- Allowing for intrafamilial transfers?
- Allowing for differing life expectancies?
- Including only defense in G?
- Having two sectors, two types of capital?

Are the results sensitive to...

- Varying age-dependent productivities? No
- Including annuity markets? No
- Including more productivity types? No
- Lowering the labor elasticity? No
- Allowing for intrafamilial transfers? No
- Allowing for differing life expectancies? No
- Including only defense in G? No
- Having two sectors, two types of capital? Yes

Conclusions

- Find welfare-improving reform for retirement financing
- Future plans are to extend analysis:
    - Incorporate specific types of elderly transfers
    - Allow for global capital and portfolio flows

Appendix

Business Tangible vs. Intangible Investment

- Our estimates found indirectly via national accounts, taxes
- Corrado, Hulten, Sichel use estimates on investments:
  - Computerized information (e.g., software)
  - Innovative property (e.g., R&D)
  - Economic competencies (e.g., brands, org. capital)
- Main findings for 2000–2003:
  - Tangibles included in GDP ≈ 0.085 GDPs
  - Intangibles included in GDP ≈ 0.024 GDPs
  - Intangibles not included in GDP ≈ 0.093 GDPs

Treatment of Employer Benefits

- Employer pension contributions affect marginal rates

$$\begin{aligned}\text{After-tax income} &= y - \tau^m(y - \alpha y) \\ &= y - \underbrace{(1-\alpha)\tau^m}_{\text{new rate}} y\end{aligned}$$

- Employer-sponsored insurance affects budget sets

$$\begin{aligned}\text{After-tax income} &= y - \tau^m(y - f) \\ &= y - \underbrace{\tau^m y}_{\text{marginal tax}} + \underbrace{\tau^m f}_{\text{part of } \Psi^w}\end{aligned}$$

HSV Estimates

- Heathcote-Storesletten-Violante used as comparison

- HSV estimate $\lambda = 4.74$ and $\tau = .151$:

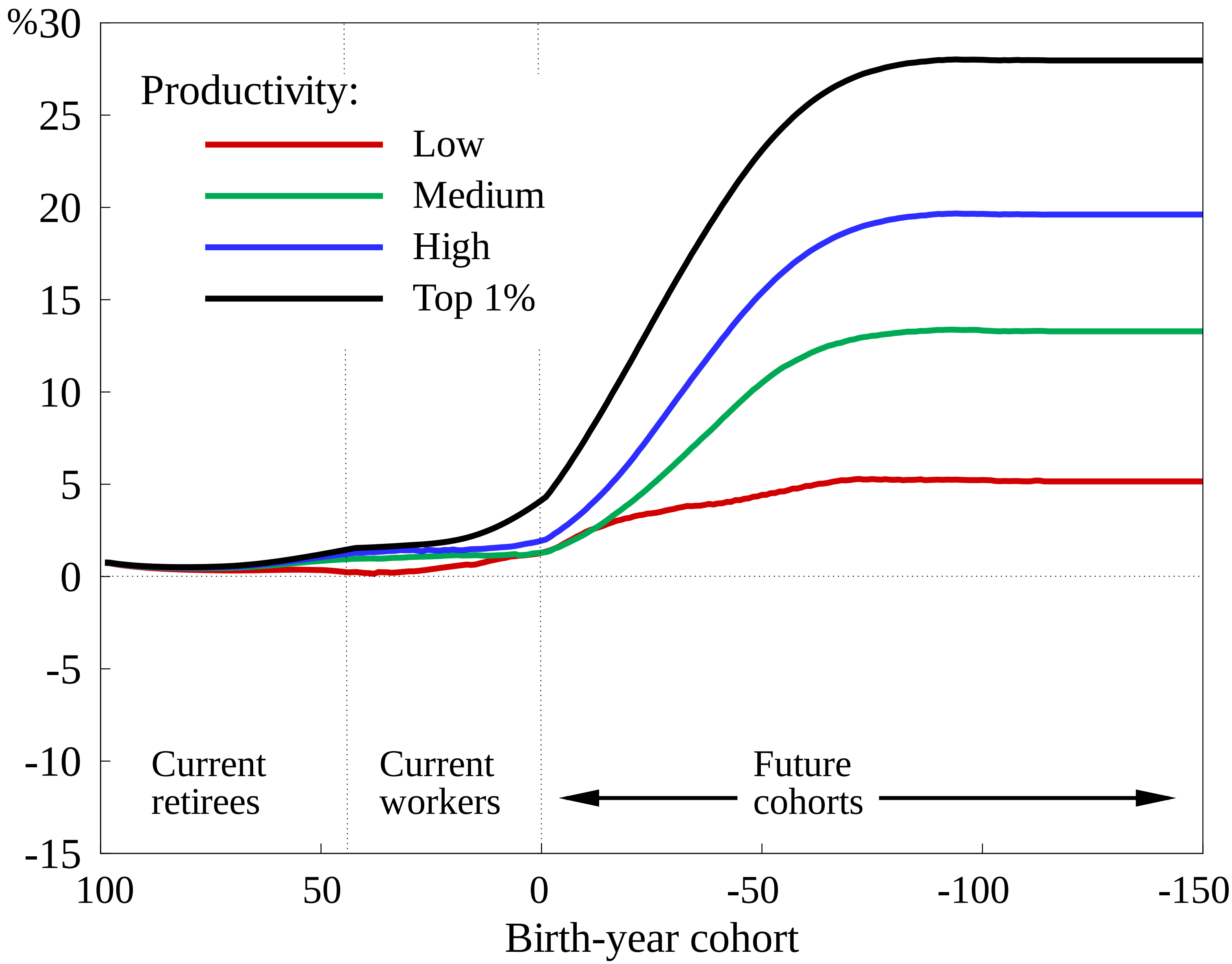
$$T^w(y) = y - \lambda y^{1-\tau}$$

  with

  - Panel Survey of Income Dynamics (PSID) data
  - Households with head aged 25-60
  - Households working at least 260 hours
  - Exclude taxes for Social Security and Medicare
  - Exclude transfers not recorded in PSID
  - Extrapolate for incomes lower than $5,000

Additional Reforms

Welfare: Phase out Capital Taxes



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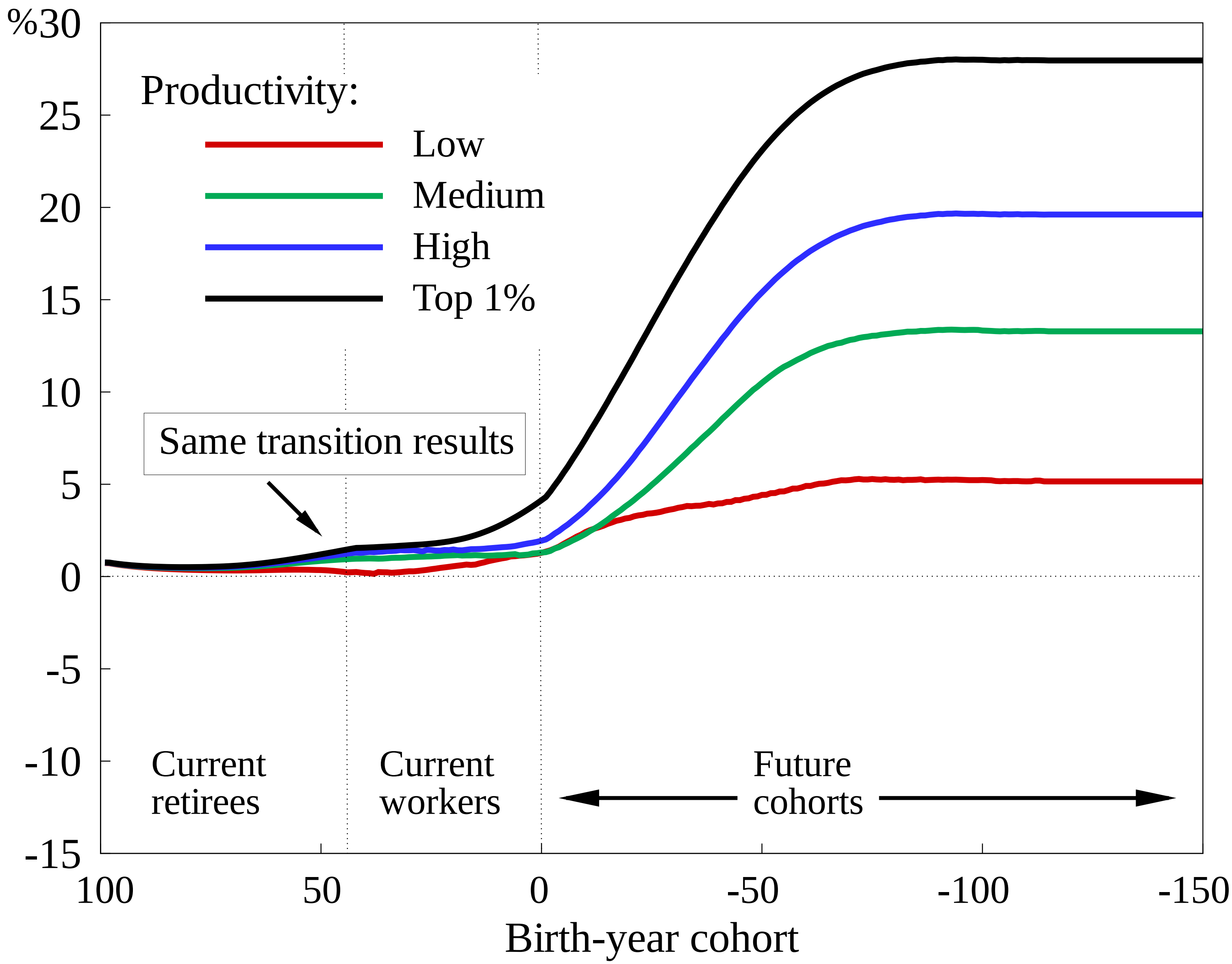

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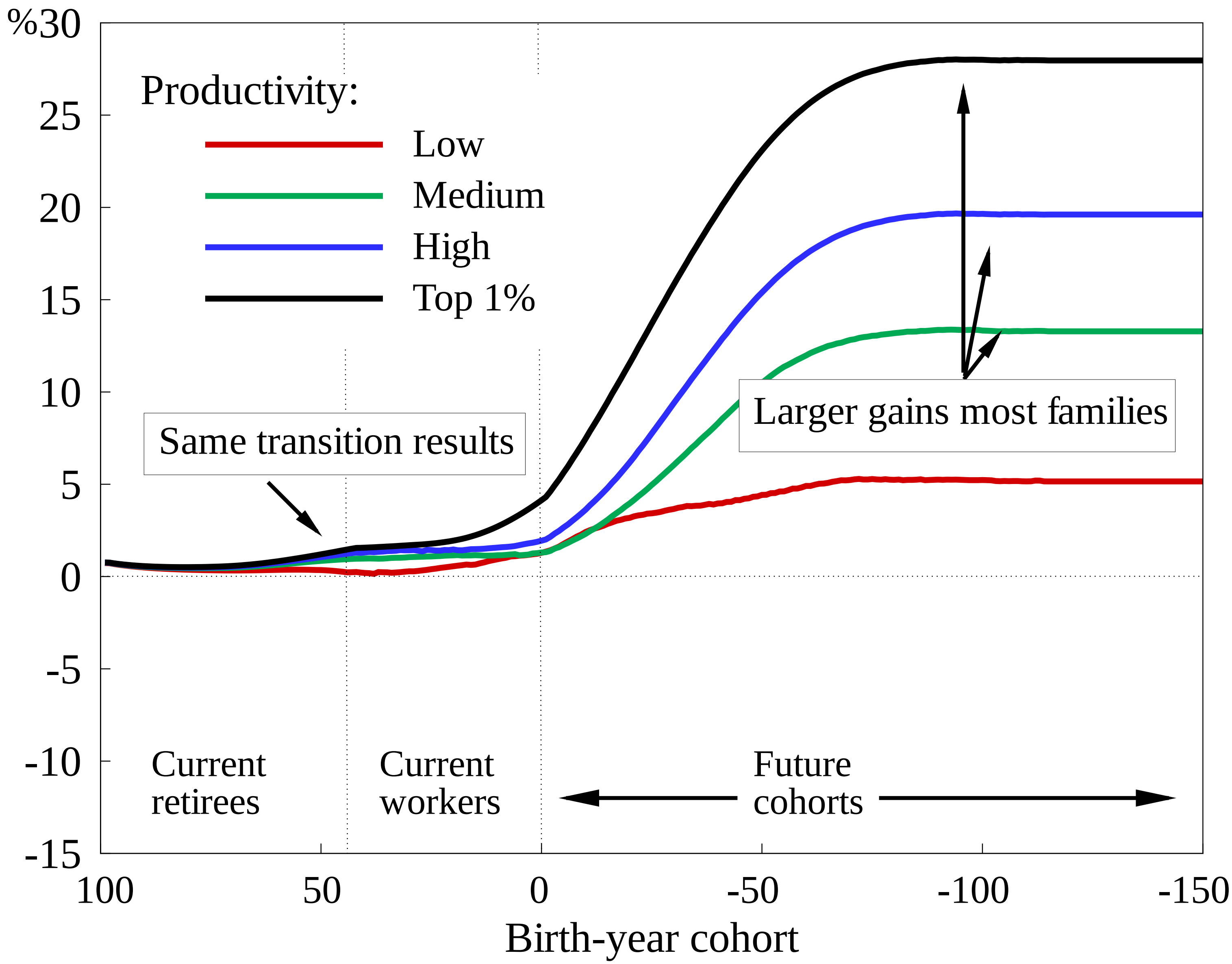
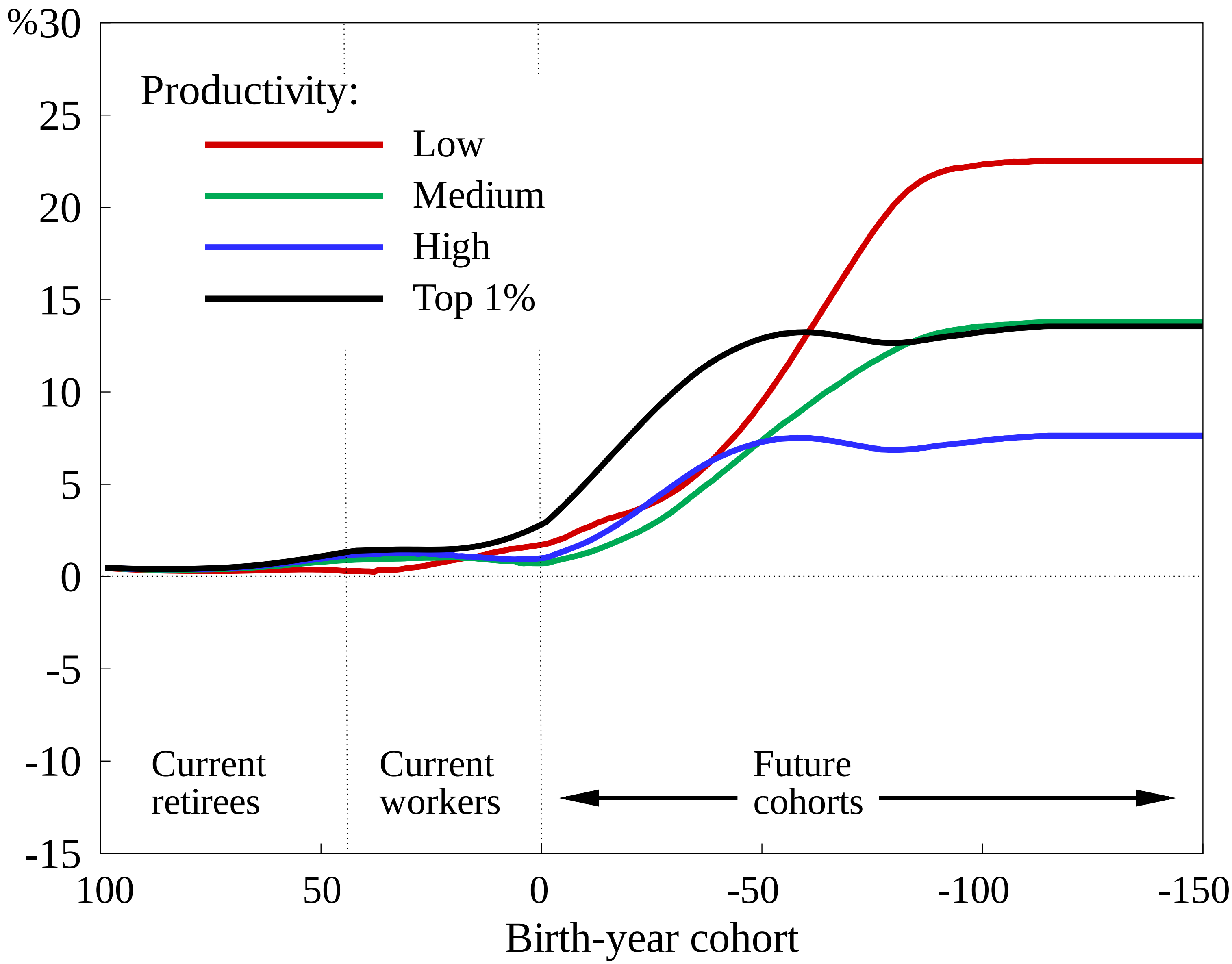


Introduce New Transfers for Low & Middle Incomes



Introduce New Transfers for Low & Middle Incomes