



QUANTIFYING EFFICIENT TAX REFORM

JOB BOERMA AND ELLEN MCGRATTAN

JULY 2021



Want

- To quantify welfare gains from efficient tax reform
 - Baseline:
 - Positive economy matched to administrative data
 - Reform:
 - Pareto improvements on efficient frontier (full)
 - Optima given set of policy tools (restricted)

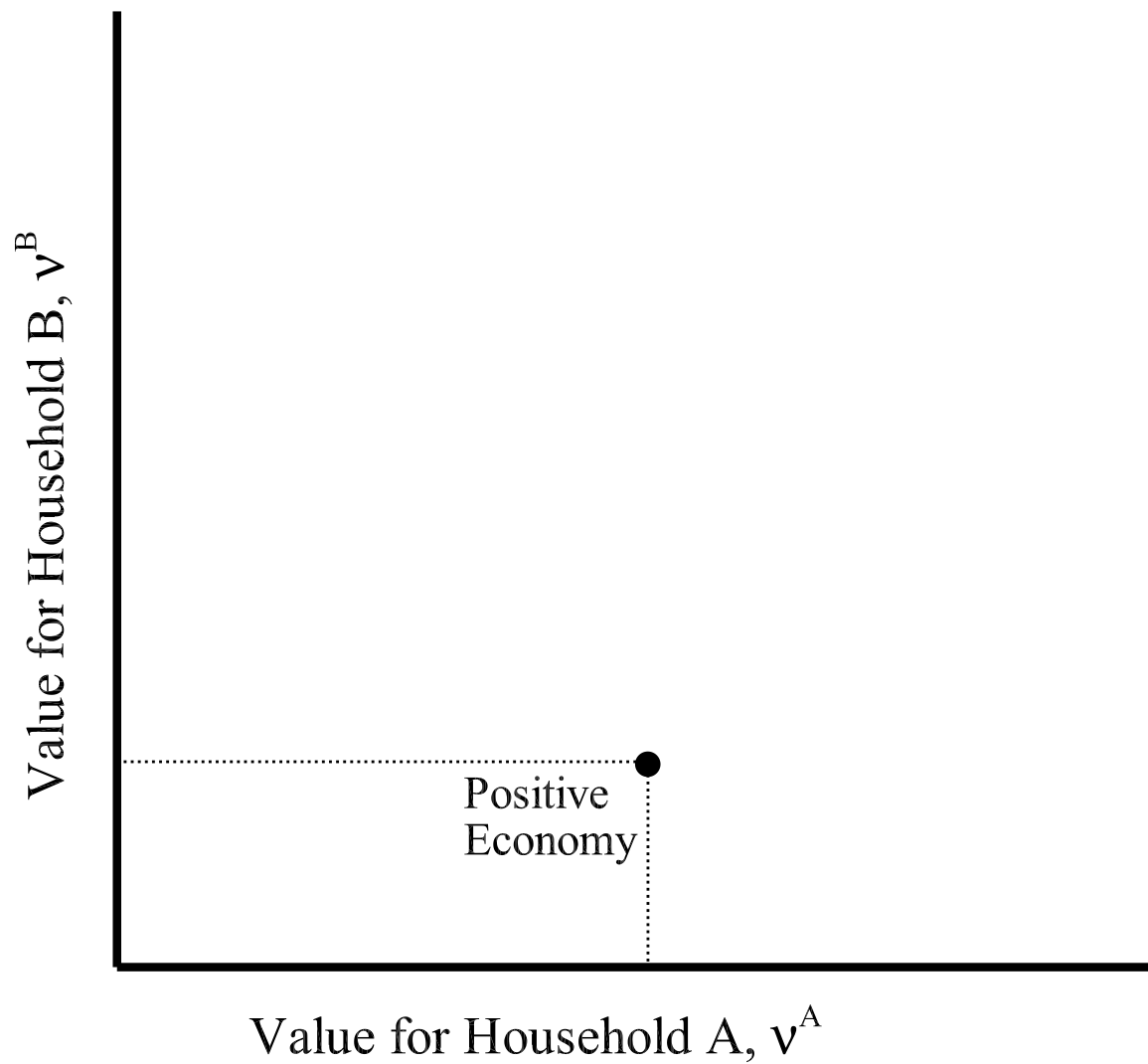


Idea in a Picture

- Start with baseline OLG economy:
 - Incomplete markets
 - Heterogeneous households
 - Differ in education levels of members
 - Face productivity, marital, unemployment risks
 - Decide on consumption, saving, hours
 - Technology parameters and tax policies
- Compute remaining lifetime utilities (v^j)
- Let's draw this for 2 households...



Idea in a Picture





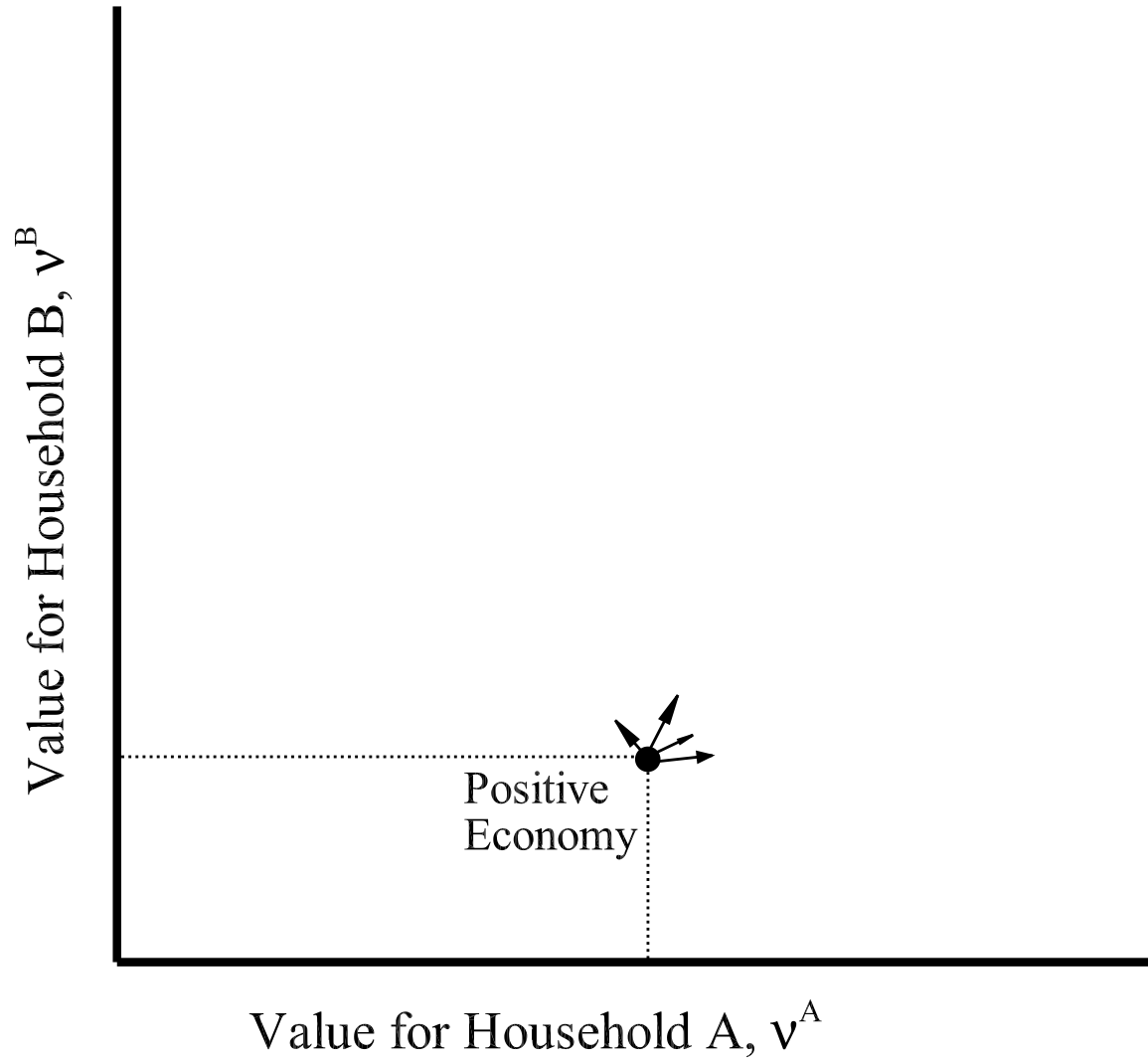
Idea in a Picture

- Typical starting point for most analyses
 - With constraints on policy instruments
 - Do counterfactuals or restricted optimal (“Ramsey”)

- Let’s draw this in the picture



Idea in a Picture





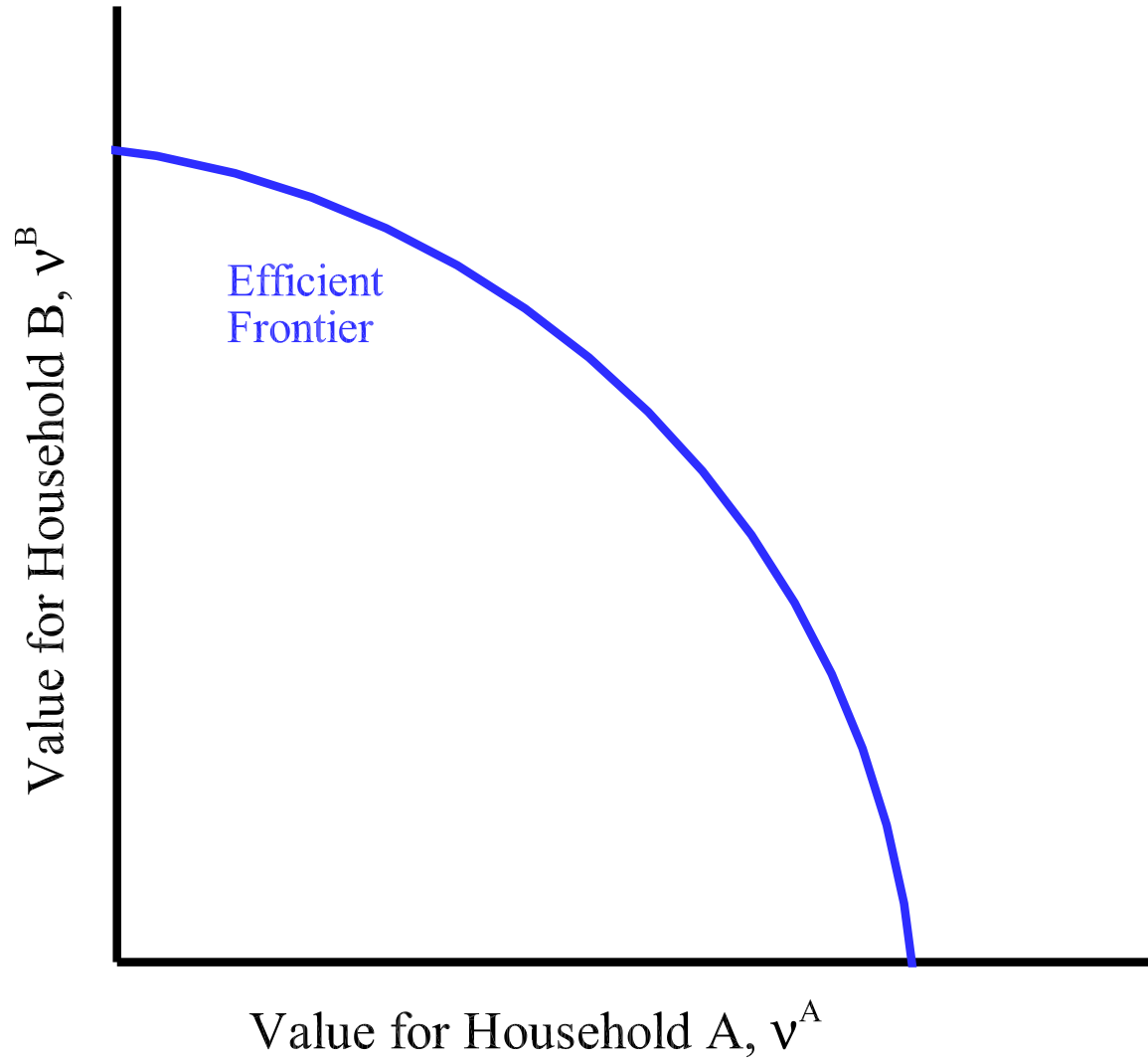
Idea in a Picture

- Not typical starting point for studies in Mirrlees tradition
 - With constraints on information sets
 - Characterize efficient allocations and policy “wedges”

- Let’s draw this in the picture



Idea in a Picture





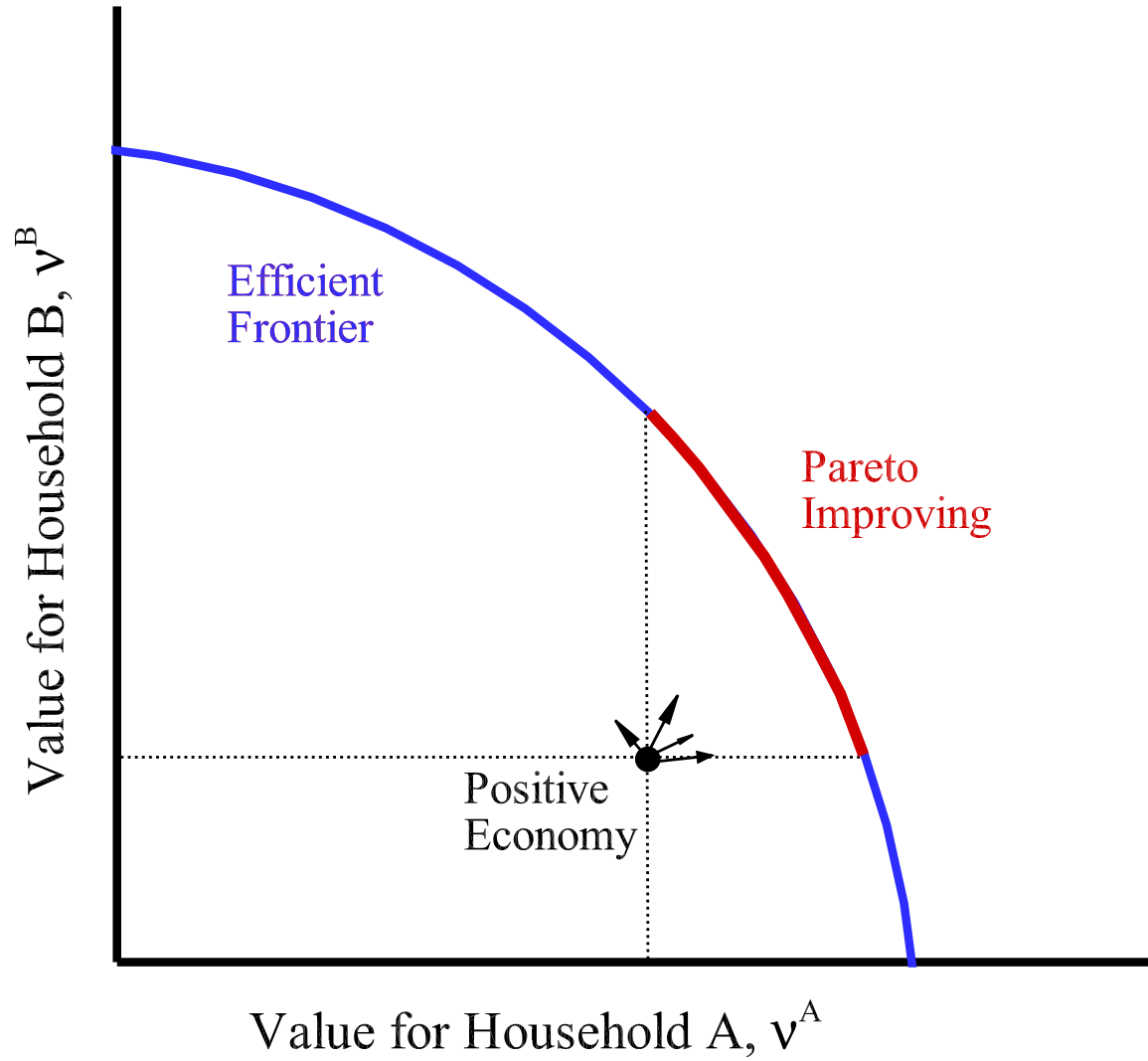
Idea in a Picture

- This paper quantifies gains from:
 - Full Pareto-improving reform a la Mirrlees
 - Partial Pareto-improving reform a la Ramsey

- Let's draw this in the picture

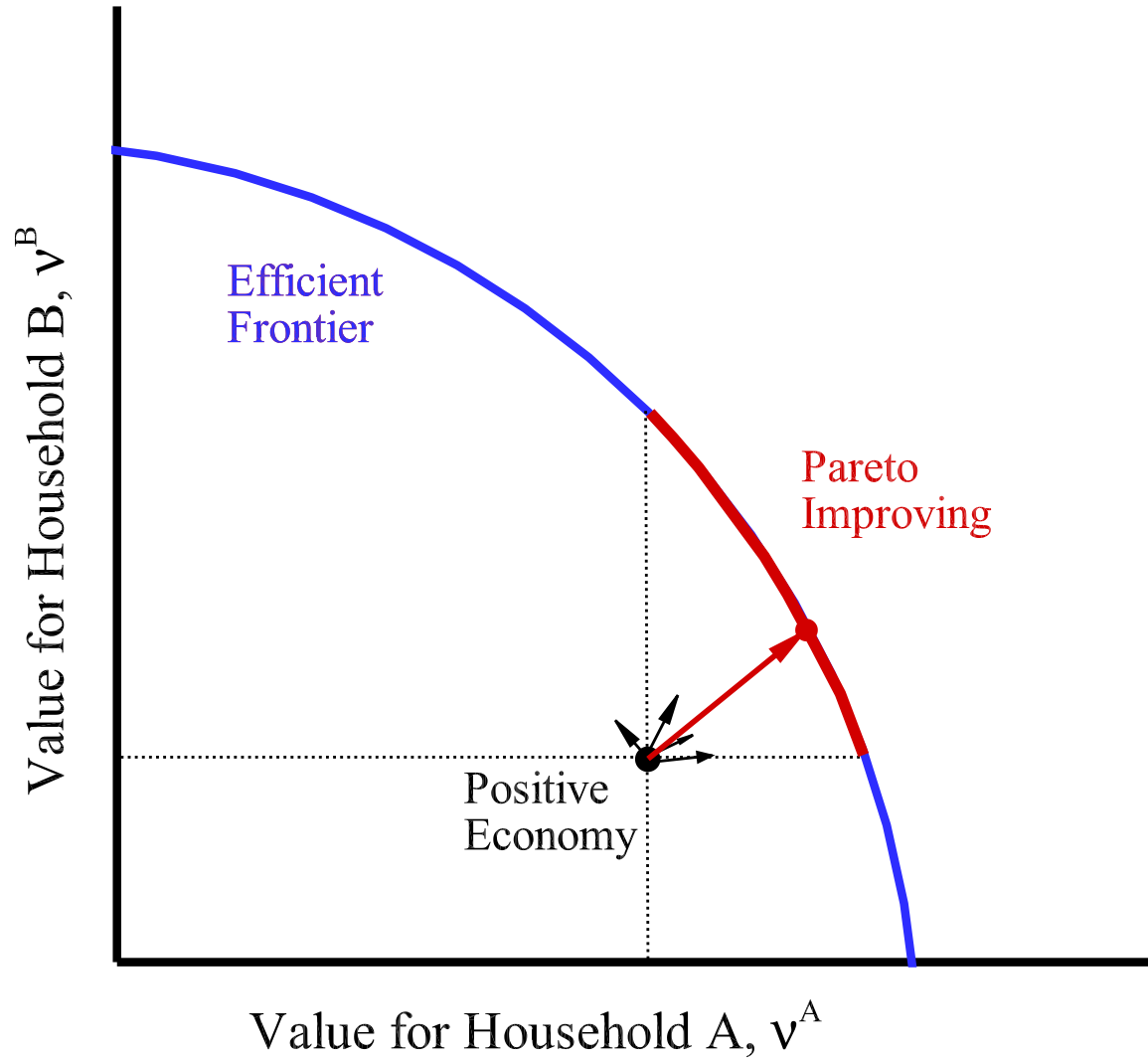


Idea in a Picture



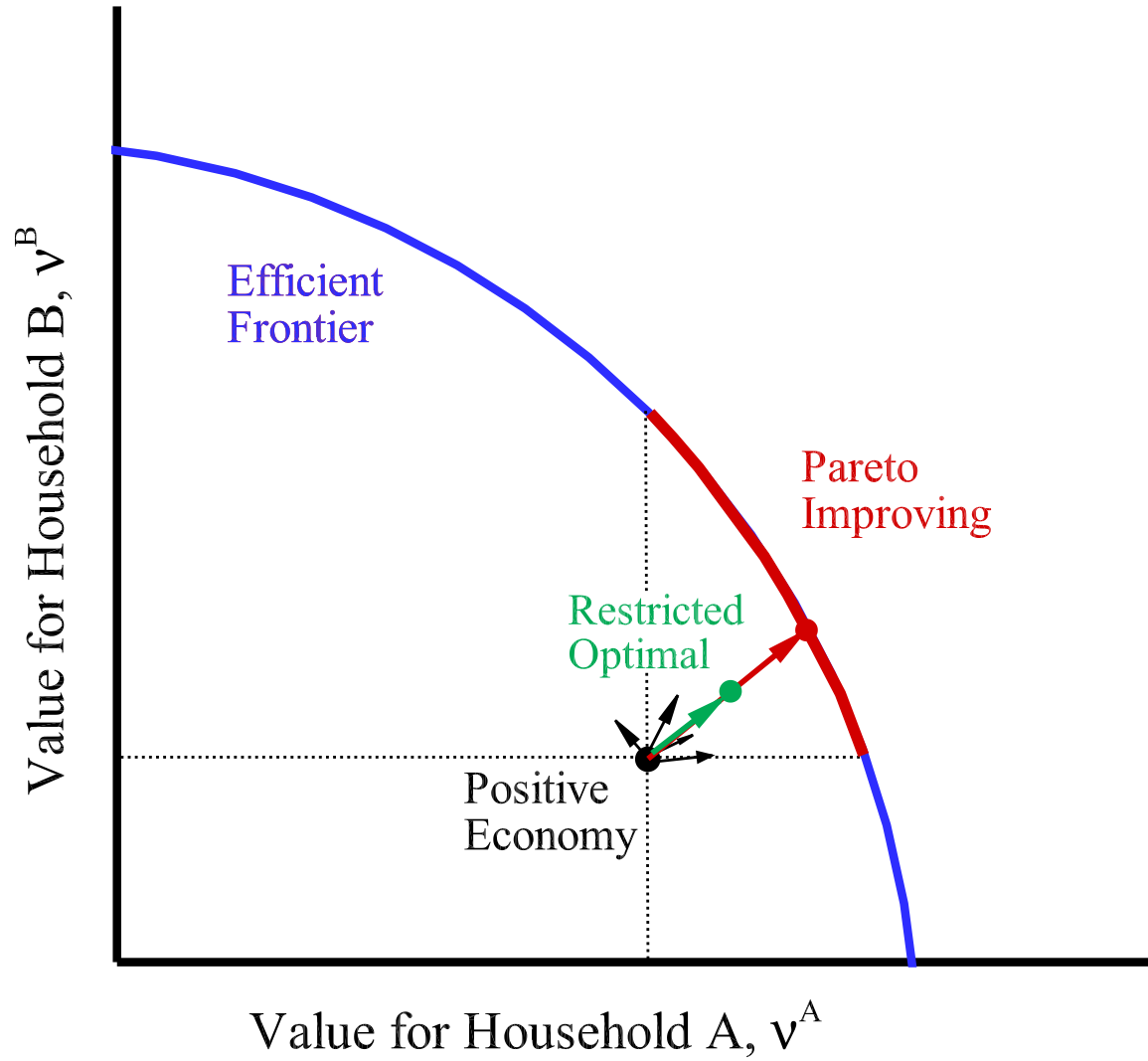


Idea in a Picture





Idea in a Picture





Our Approach

- Solve equilibrium for positive economy (●)
 - Inputs: fiscal policy and wage processes
 - Outputs: values under current policy
- Solve planner problem next (●)
 - Inputs: values under current policy
 - Outputs: labor and savings wedges and welfare gains
- Use results to inform current policy and reforms (●)



Positive Economy: Some specifics (●)

- Open OLG economy a la Bewley
- Household heterogeneity in:
 - Age
 - Education (observed, permanent)
 - Productivity (private, stochastic)
 - Marital risk
 - Divorce risk (in progress)
 - Unemployment risk (in progress)
- Transfers and taxes on consumption, labor income, assets



Positive Economy: Some specifics (•)

- Household problem

$$v^j(a, \epsilon; \Omega) = \max_{c, n, a'} U(c, \ell) + \beta E[v^{j+1}(a', \epsilon'; \Omega) | \epsilon]$$

$$\text{s.t. } a' = (1 + r)a - T_a(ra) + w\epsilon n - T_n(j, w\epsilon n) - (1 + \tau_c)c$$

where

- j = age
- a = financial assets
- ϵ = productivity shock
- Ω = factor prices and tax policies
- c = consumption
- n = labor supply ($n + \ell = 1$)



Positive Economy: Some specifics (●)

- Firms:
 - Technology: $F(K, N) = K^\alpha N^{1-\alpha}$
 - Prices: r, w set internationally

- Government:
 - Taxes: consumption, incomes, assets
 - Borrows: at home and abroad



Positive Economy: Some specifics (•)

- In equilibrium:

$$C_t + I_t + G_t + B_{t+1} = F(K_t, N_t) + RB_t$$

$$\lim_{T \rightarrow \infty} \frac{1}{R^{T-1}} (B_T + K_T) \geq 0$$

- Then use answers as inputs into planner's problem



Reform Problem: Some specifics (●)

- Take inputs from positive economy:
 - Parameters for preferences and technologies
 - Wage profiles and shock processes
 - Values under current policy (v^A, v^B, \dots)
- Compute maximum consumption equivalent gain



Planner Problem (Primal)

- Maximize weighted sum of lifetime utilities
- subject to
 - Incentive constraints for every household and history
 - Resource constraints
- But, computationally easier to solve dual problem



Planner Problem (Dual)

- Maximize present value of aggregate resources
- subject to
 - Incentive constraints for every household and history
 - Value delivered exceeds that of positive economy



Planner Problem (Dual)

$$\max \sum_h \pi_0(h) \Pi_0(V^h, -, \epsilon)$$

subject to

- Incentive constraints for all h
- $V^h \geq v^h$ for all h



Quantitative Deliverables

- Wedges
- Welfare gains
 - Total consumption equivalent
 - Decomposition
- Implied Pareto weights
- Sensitivity to parameter choices
- Insight for restricted policy reforms



Wedges

- Labor wedge:

$$\tau_n(\epsilon^j) = 1 - \frac{1}{w} \frac{U_\ell(c(\epsilon^j), \ell(\epsilon^j))}{U_c(c(\epsilon^j), \ell(\epsilon^j))}$$

- Savings wedge:

$$\tau_a(\epsilon^j) = 1 - \frac{U_c(c(\epsilon^j), \ell(\epsilon^j))}{\beta RE[U_c(c(\epsilon^{j+1}), \ell(\epsilon^{j+1})) | \epsilon^j]}$$



Application to Netherlands



Data from Netherlands

- Merged administrative data, 2006-2014
 - Earnings from tax authority
 - Hours from employer provided data
 - Education from population survey
 - National accounts
 - Tax schedules
- ⇒ Big data advantage for estimating elasticities & shocks



Estimation of Wage Processes

- Construct hourly wages W_{ijt} (j =age, t =time)
- Classify degrees:
 - High school or practical (Low)
 - University of applied sciences (Medium)
 - University (High)
- Construct residual wages ω_{ijt} :
 - $\log W_{ijt} = A_t + X_{ijt} + \omega_{ijt}$
 - Estimate AR(1) process for idiosyncratic risk



Marriage and Household Structure

- In period 0, individuals are single
 - Different by education (L,M,H)
- After that, individuals either
 - Form a couple (LL,LM,LH,MM,MH,HH) or
 - Remain single (included with LL,MM,HH)

Note: Working on adding divorce risk



Other Key Parameters

- Number of productivity types (50)
- Status quo tax/transfers (NL)
- Preferences:

1. $U(c, \ell) = \gamma \log c + \kappa n^\rho$

2. $U(c, \ell) = \gamma \log c + (1 - \gamma) \log \ell$

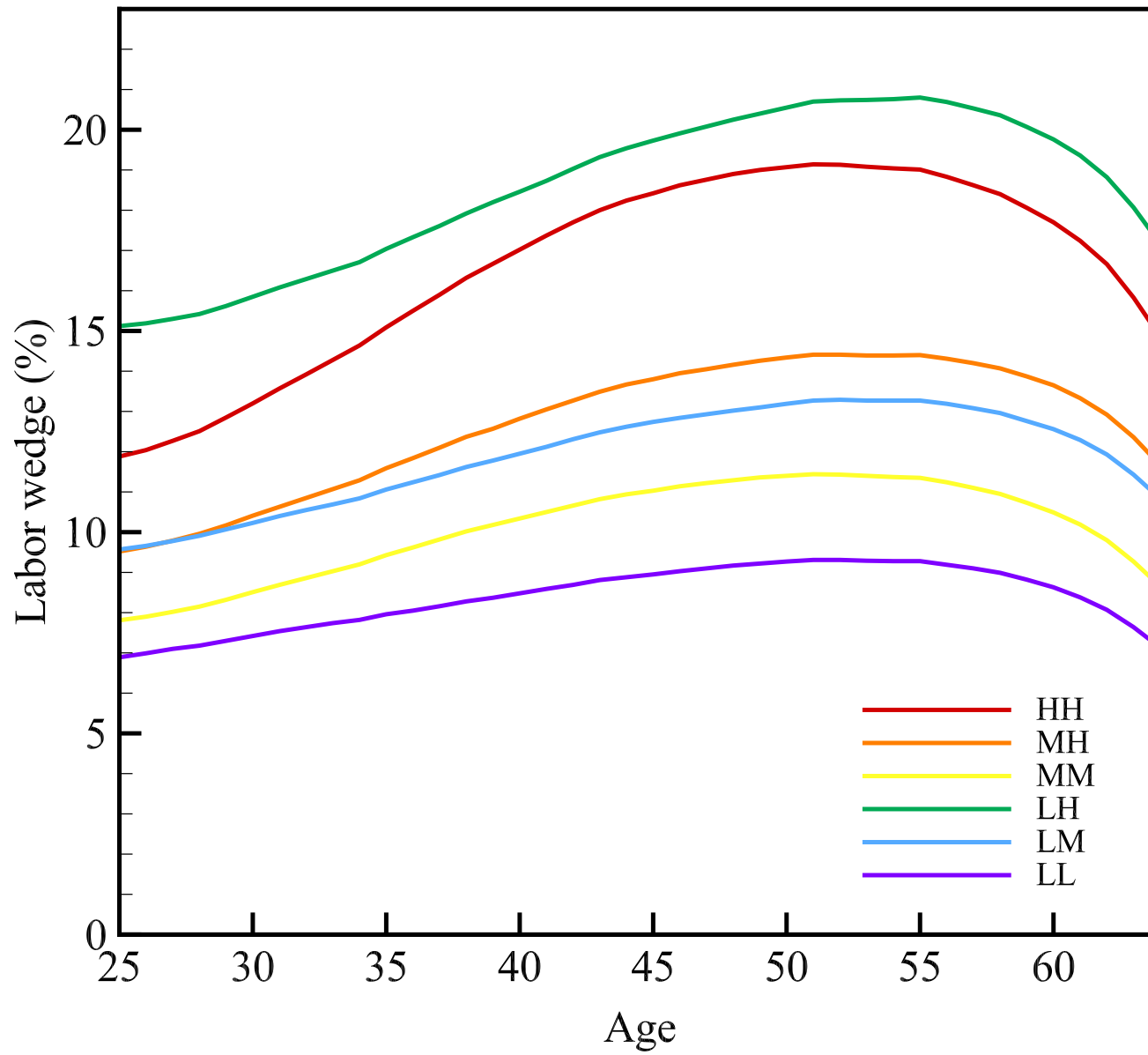
with different labor elasticities (0.5 vs 3)



Results

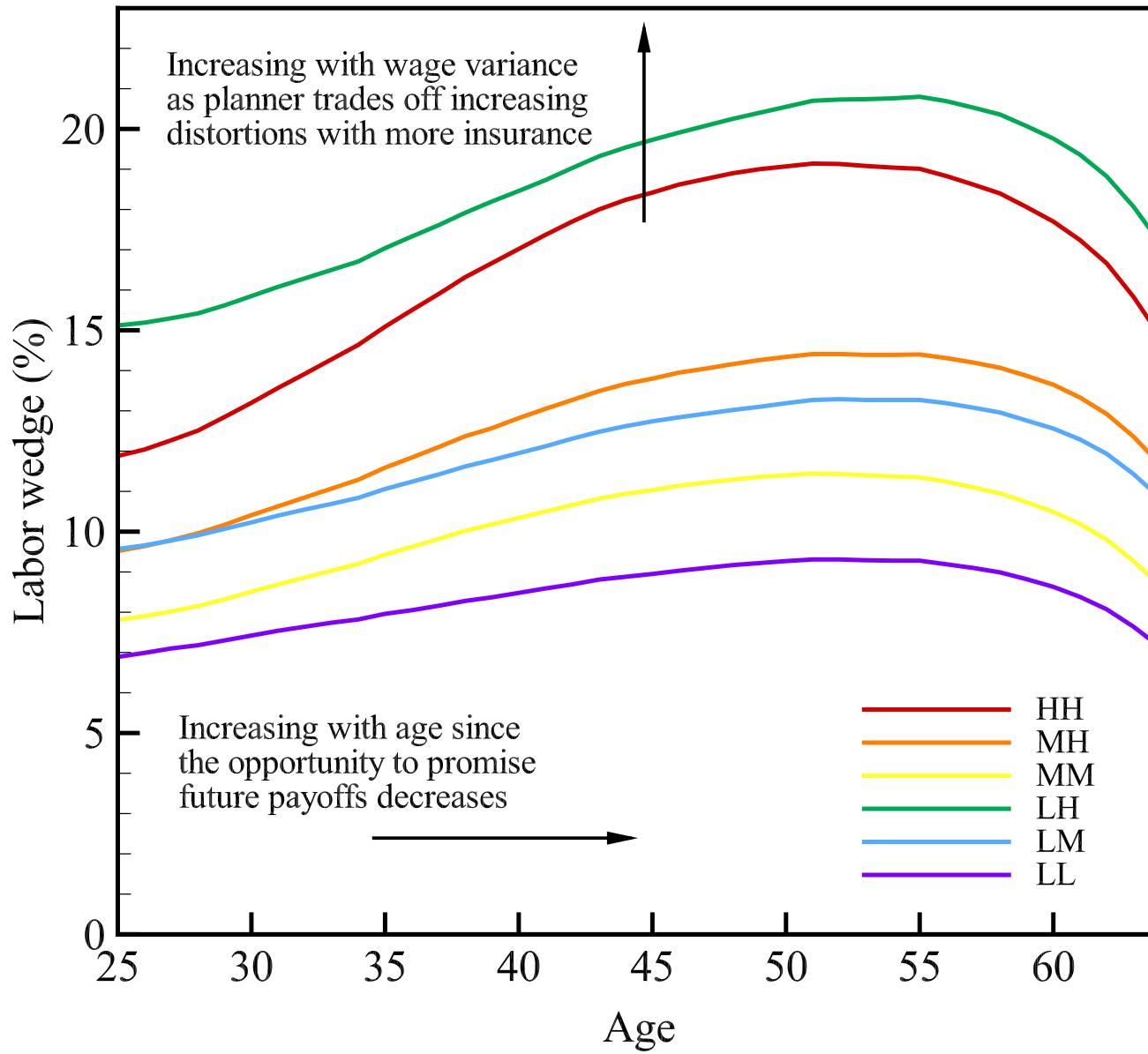


Labor Wedges



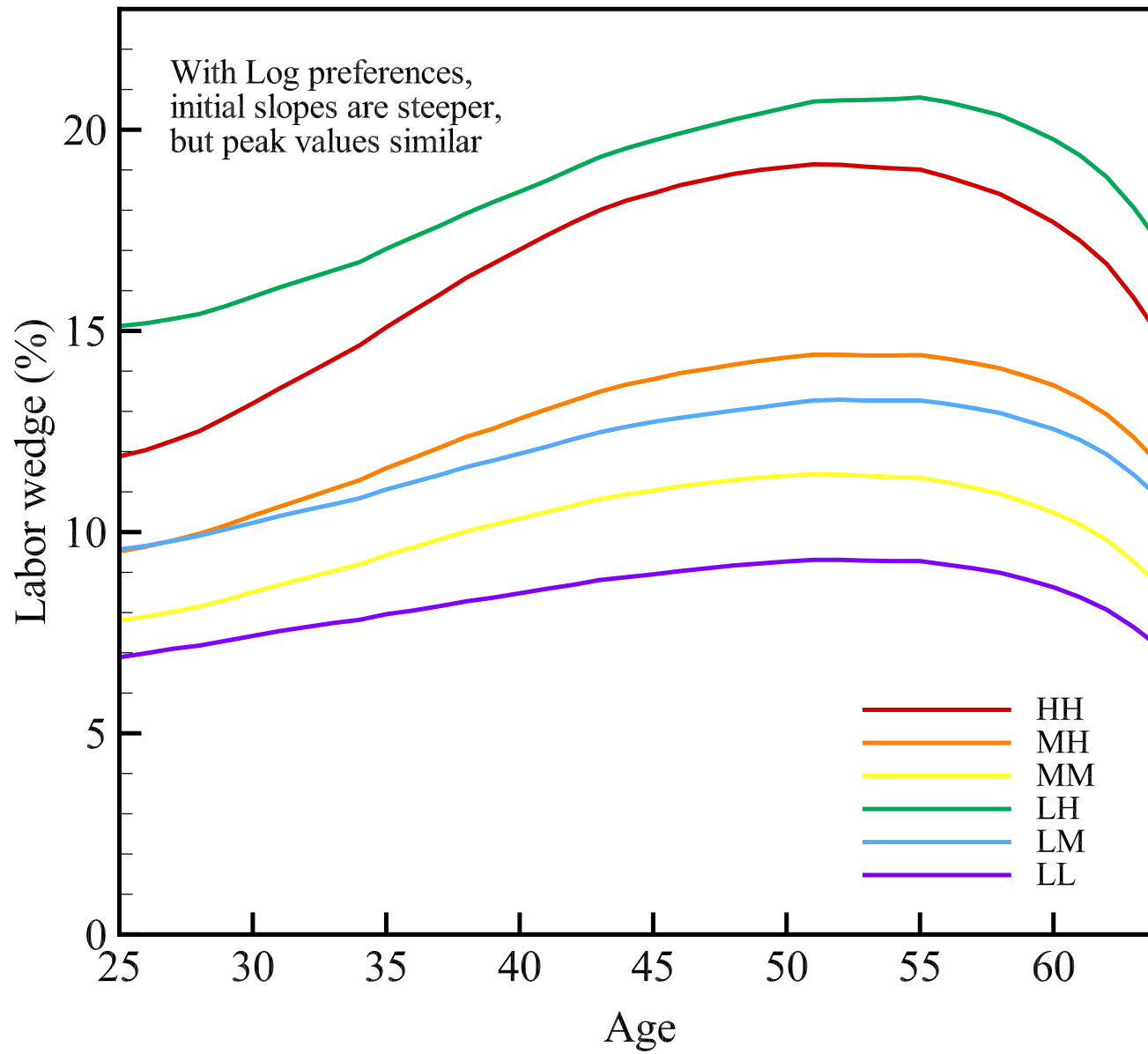


Labor Wedges





Labor Wedges



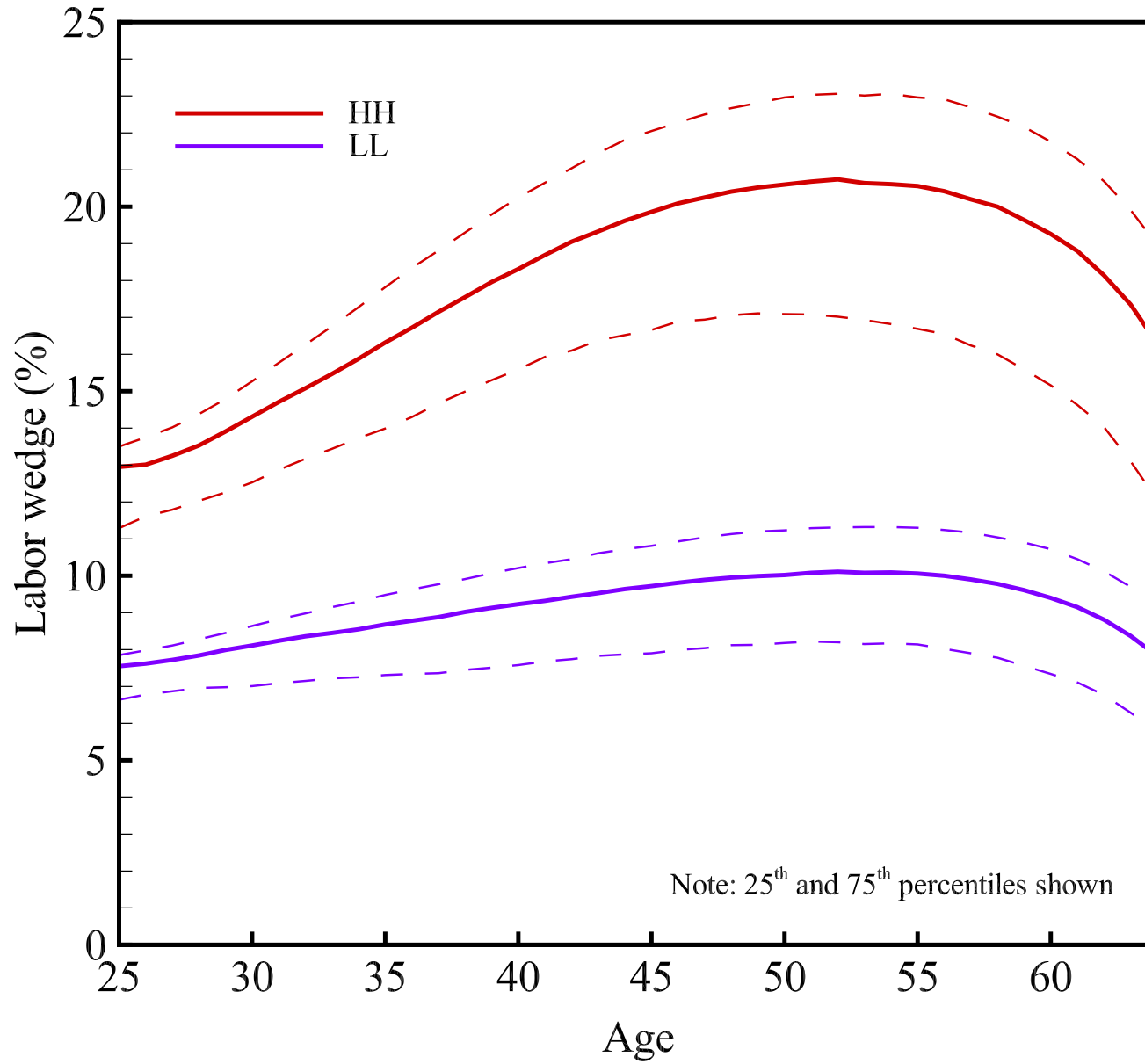


What We Learn

- Wedges are suggestive of
 - Informational frictions
 - Insurance needs
- But,
 - Average wedges are not taxes
 - Averages mask significant variation

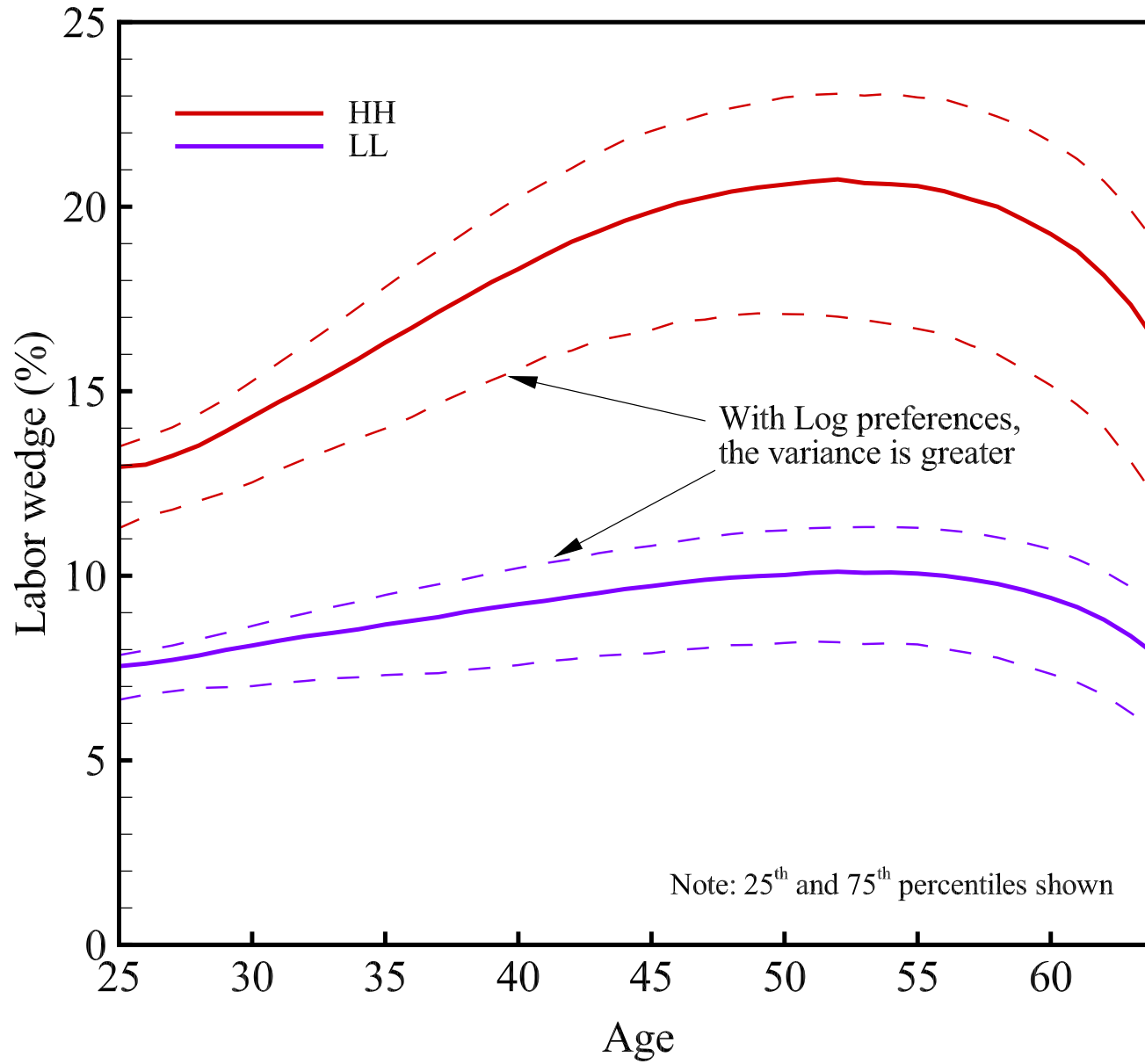


Labor Wedges for LL, HH





Labor Wedges for LL, HH





Welfare, (●) vs (●)

- Consumption equivalent gain of 15% for future cohorts
- Large but maybe not surprising given:
 - Tax rates in NL over 40%
 - Average tax wedges of planner in 6% to 21% range



Welfare, (●) vs (●)

- Consumption equivalent gain of 15% for future cohorts
- Large but maybe not surprising given:
 - Tax rates in NL over 40%
 - Average tax wedges of planner in 6% to 21% range



Welfare, (●) vs (●)

- Consumption equivalent gain of 15% for future cohorts
- Large but maybe not surprising given:
 - Tax rates in NL over 40%
 - Average tax wedges of planner in 6% to 21% range
- What are the implied Pareto weights?



Implied Pareto Weights

- Recall: could also have solved:

- $\max \sum_i \pi_i \omega_i V^i$

- subject to incentive and incentive constraints

Note: $\omega_i > 1 \Rightarrow$ overweight i relative to population share



Implied Pareto Weights

- Recall: could also have solved:
 - $\max \sum_i \pi_i \omega_i V^i$
 - subject to incentive and incentive constraints
- What are the implied ω_i 's for L,M,H?



Pareto Weights and Welfare Gains

Education	<u>Equal Gains</u>		<u>Equal Weights</u>	
	ω_i	Δ_i	ω_i	Δ_i
Low	0.8	15		
Medium	1.0	15		
High	1.3	15		



Pareto Weights and Welfare Gains

Education	<u>Equal Gains</u>		<u>Equal Weights[†]</u>	
	ω_i	Δ_i	ω_i	Δ_i
Low	0.8	15	1	28
Medium	1.0	15	1	7
High	1.3	15	1	-5

[†] Utilitarian planner with $V^H \geq V^M \geq V^L$



Pareto Weights and Welfare Gains

- With log preferences
 - Essentially same consumption equivalent gain (16%)
 - Essentially same implied Pareto weights
 - All gain with equal weights (but 0.05 for high)
- But, surprisingly close given labor elasticities of 0.5 vs 3

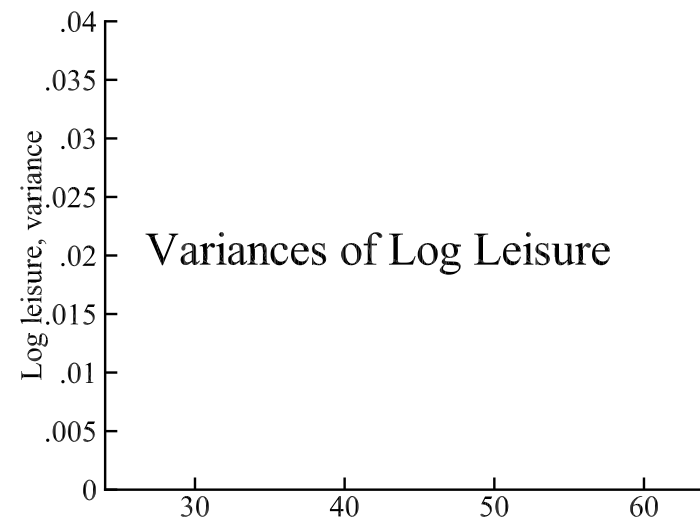
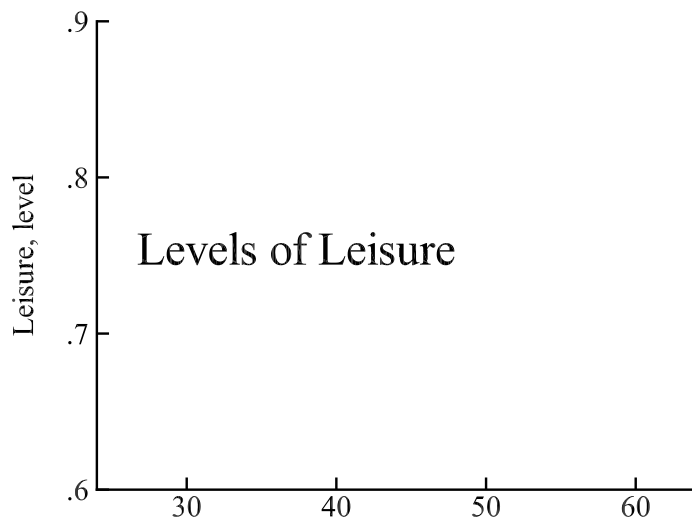
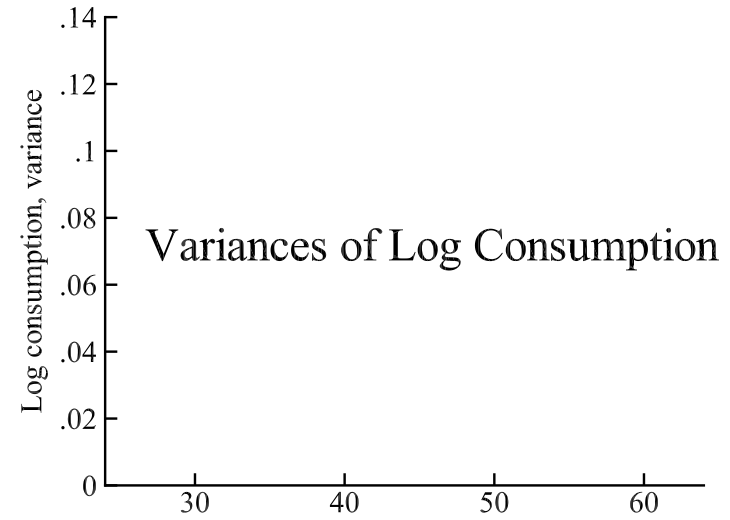
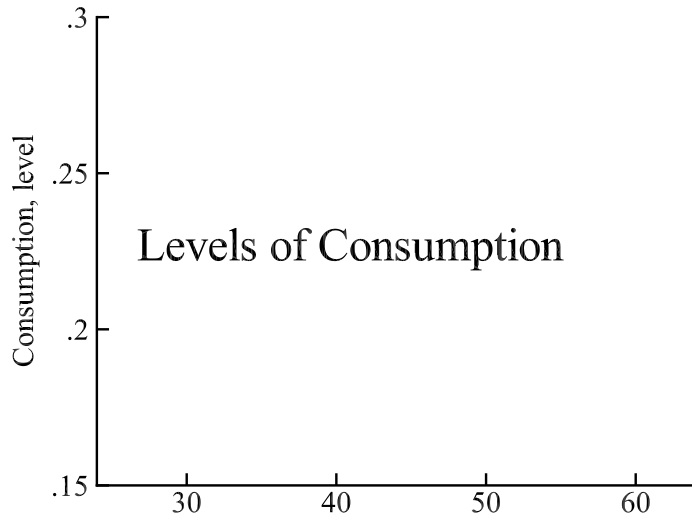


Comparing Allocations, (\bullet) vs (\bullet)

- Consumption: level \uparrow and variance \downarrow for all groups
- Leisure: level \downarrow and variance \uparrow for all groups
- Intuition from simple static model:
 - No insurance: c varies, ℓ constant
 - Full insurance: c constant, ℓ varies
- What about magnitudes?

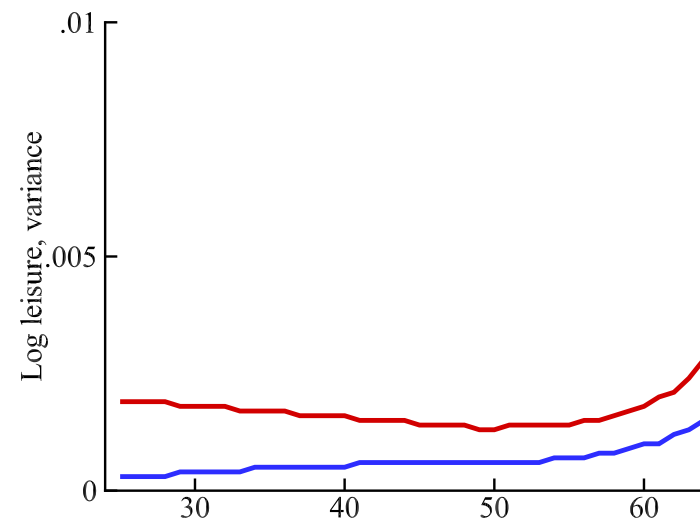
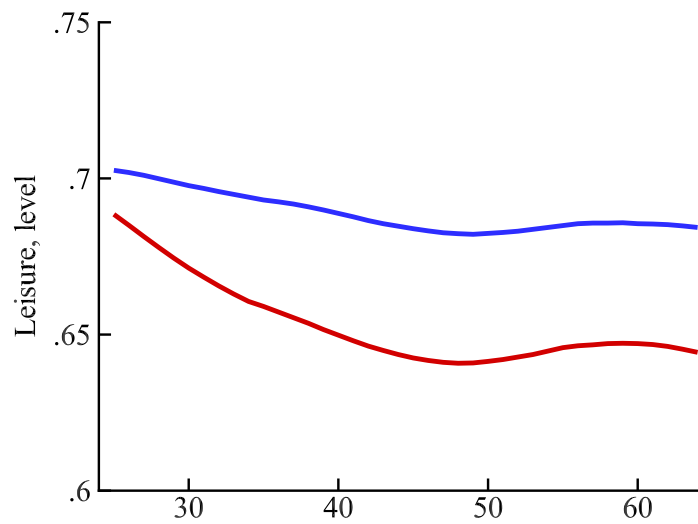
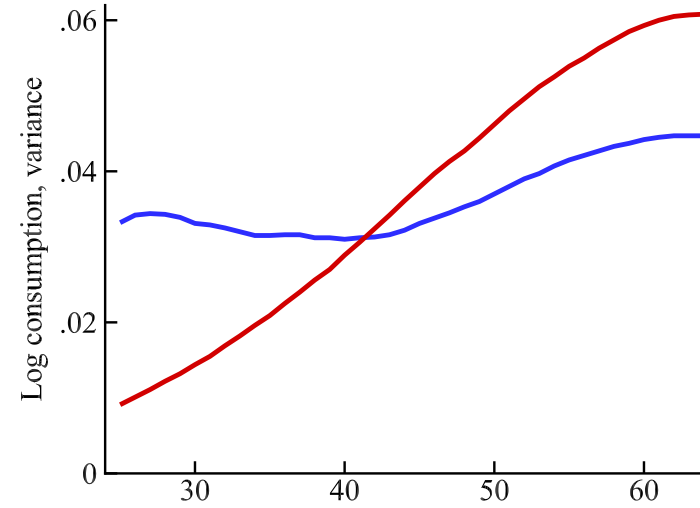
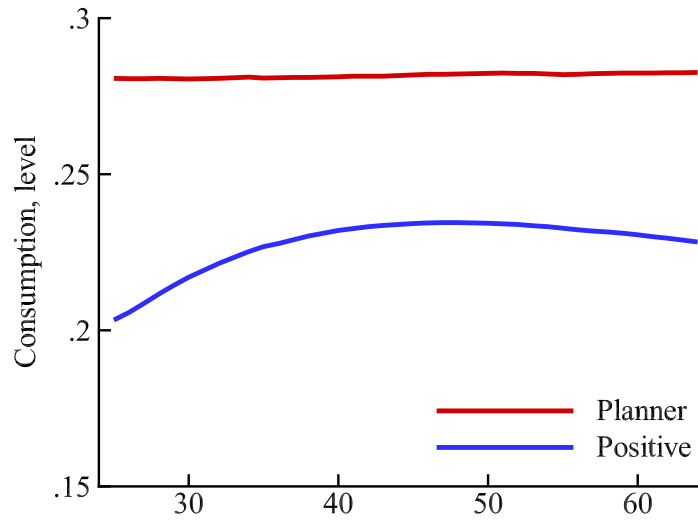


A Look Under the Hood: Group LL



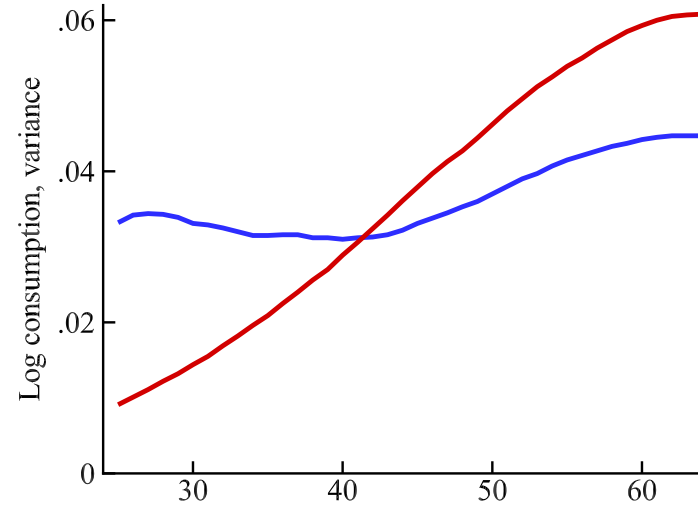
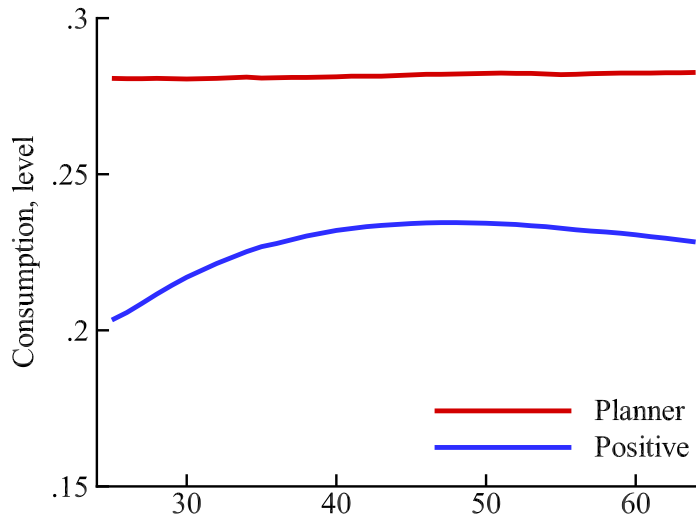


A Look Under the Hood: Group LL

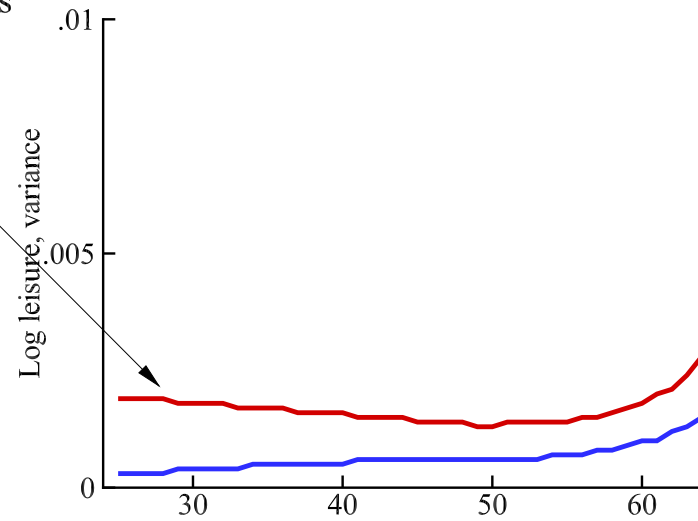
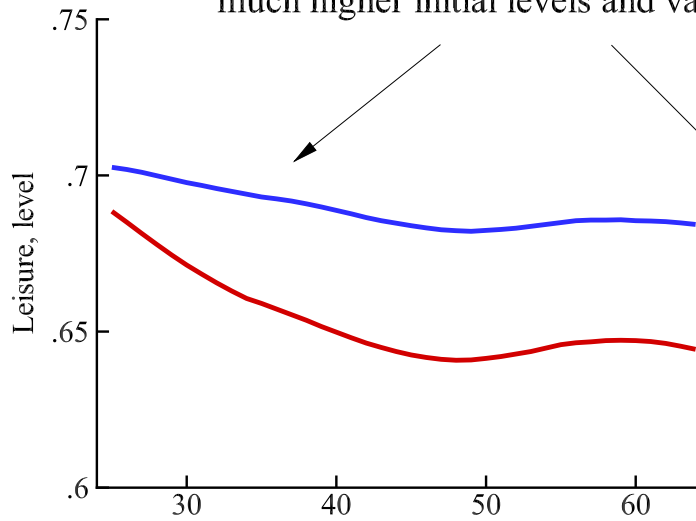




A Look Under the Hood: Group LL

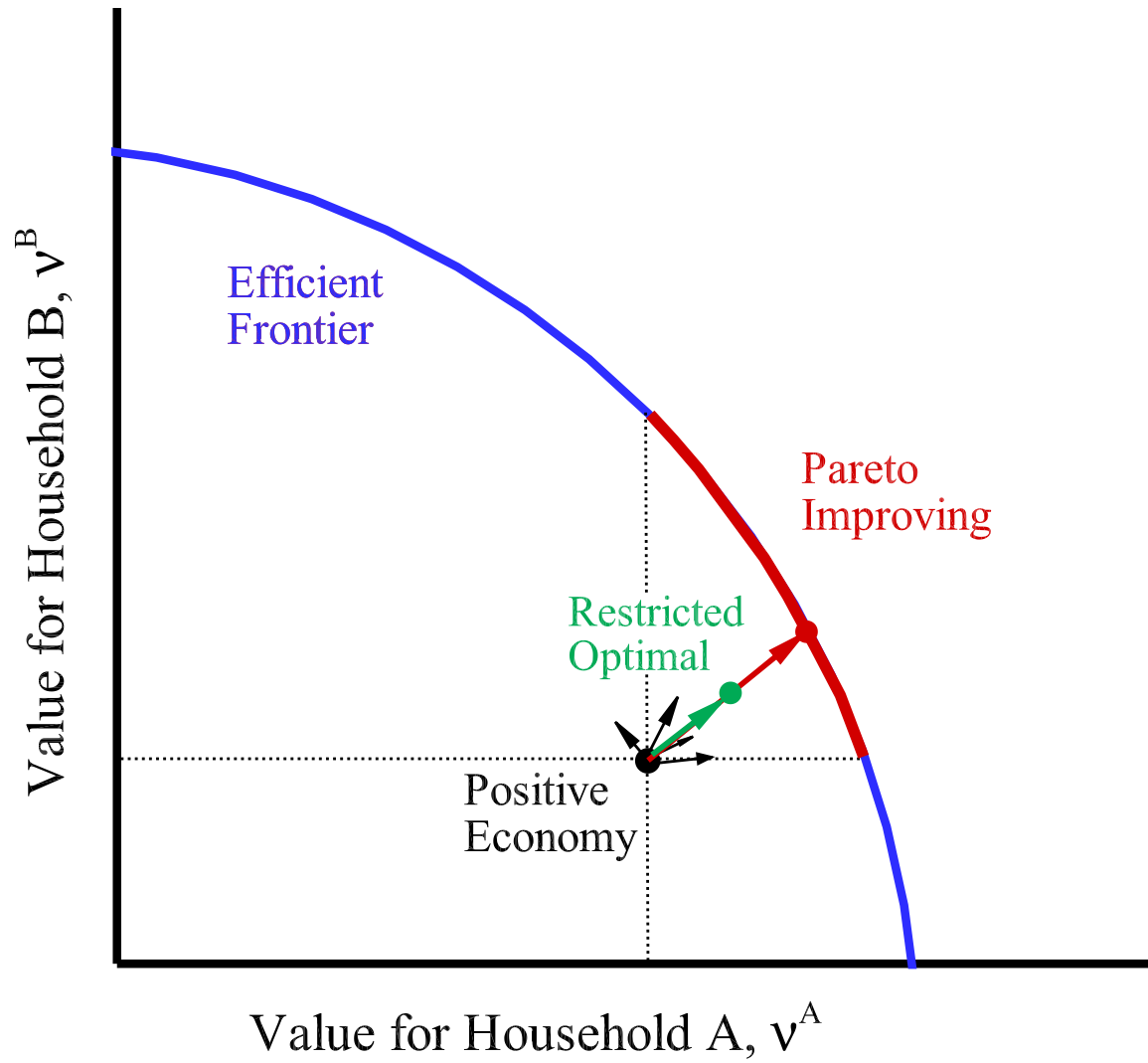


With log preferences, planner chooses much higher initial levels and variances





Informing Counterfactuals (●)





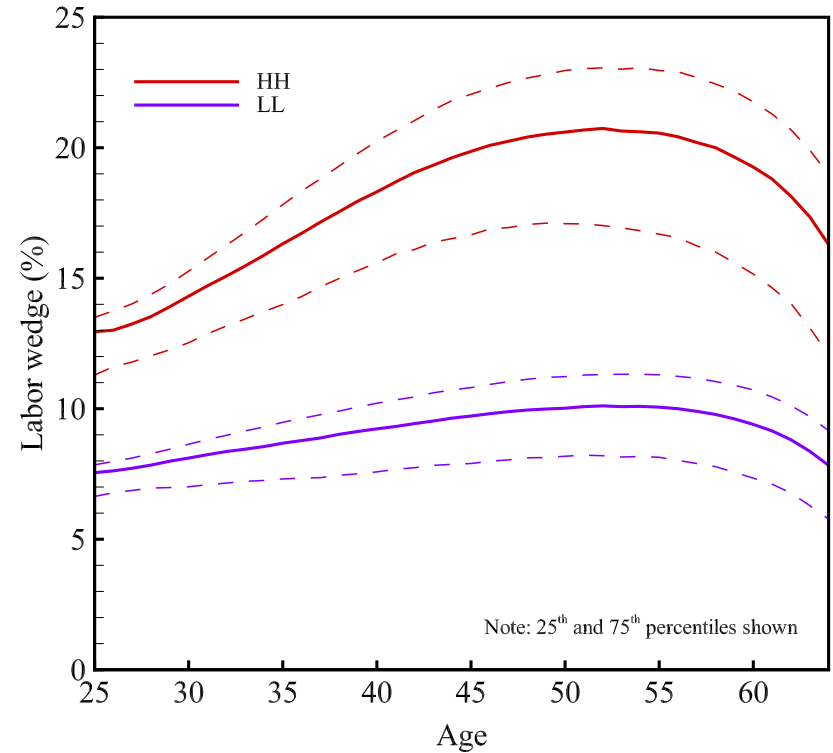
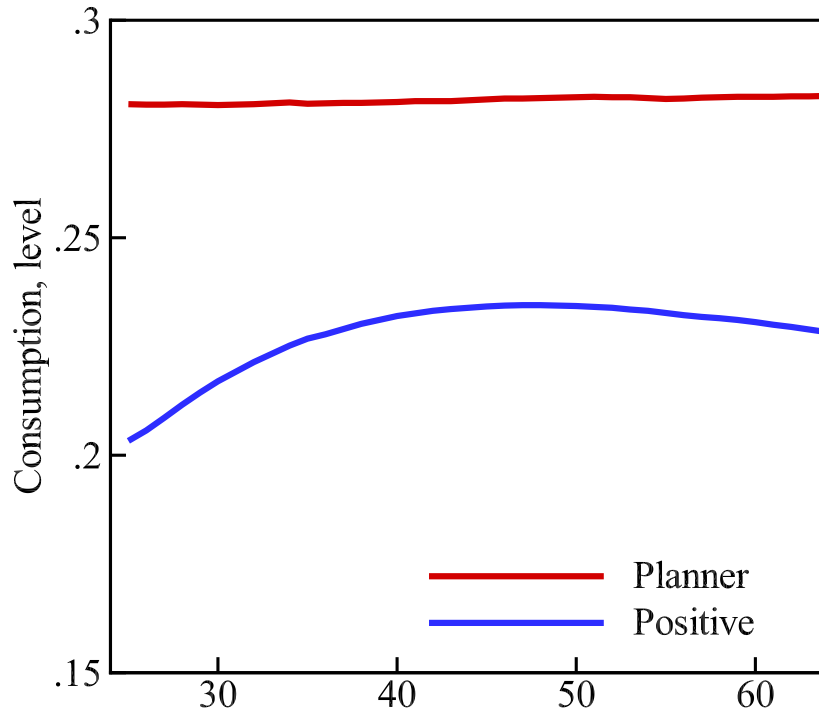
Informing Counterfactuals (●)

- Results of planner problem suggest large gains to
 - Lower average marginal tax rates
 - Early life transfers
 - Income-tested transfers

Note: our results on restricted gains still tentative



Informing Counterfactuals (●)



- Points to certain:
 - Early life transfers
 - Income-tested transfers



Summary

- Ultimate deliverables of project:
 - Estimates of gains for efficient reform
 - for any age in steady state
 - along the transition path
 - Identification of sources of gains
 - Ideas for new policy instruments
 - Prototype for future analyses
- Stay tuned...