Quantifying Efficient Tax Reform

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Question

- How large are 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 (partial)

Idea in a Picture

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- Start with baseline OLG economy:
  - Incomplete markets
  - Heterogeneous households
  - Consumption, labor, saving decisions
  - Parameters/policies for actual economy
- Compute remaining lifetime utilities (v_j)

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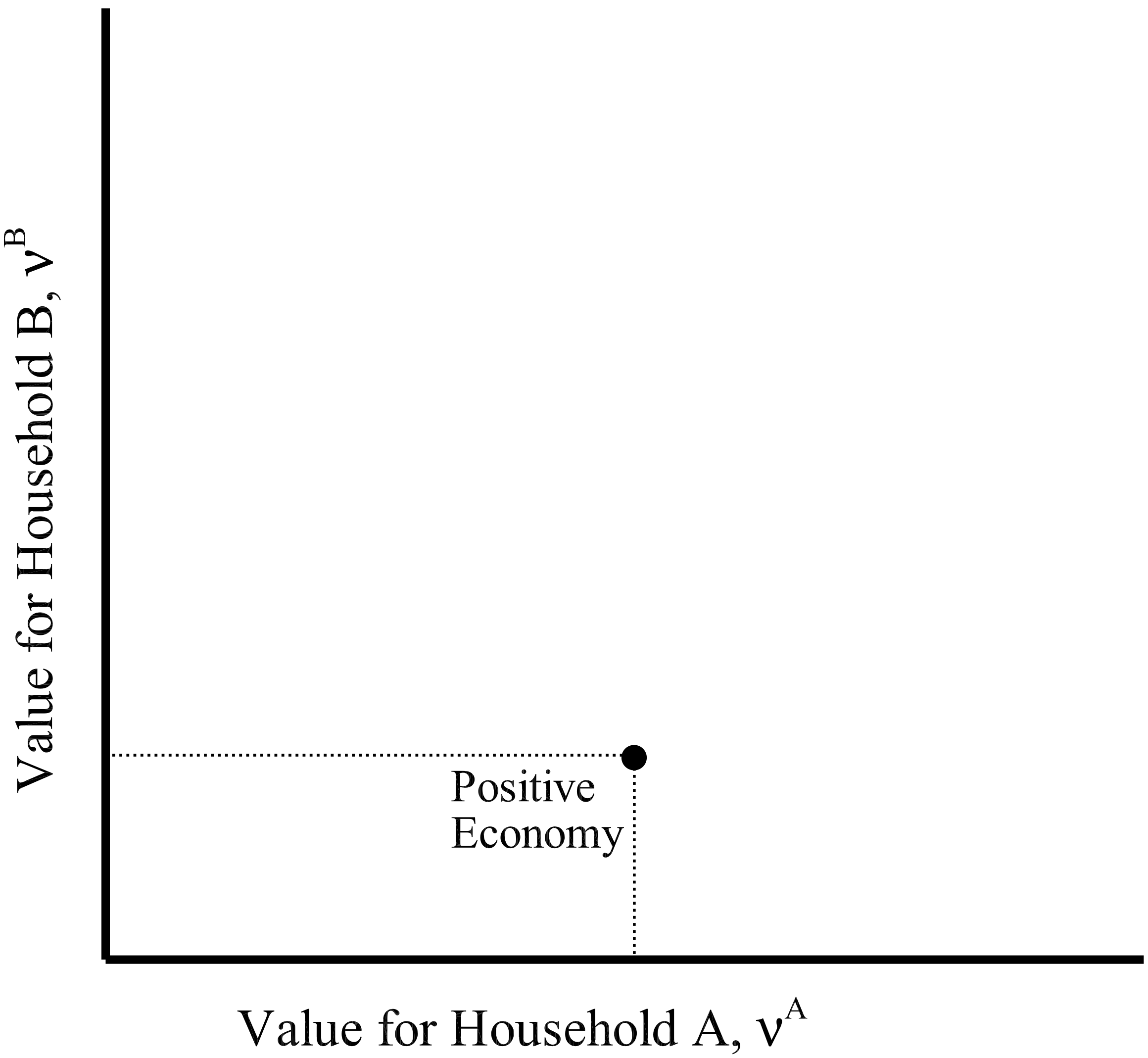
- Compute remaining lifetime utilities (v_j)
- Let's draw this for 2 households...

Idea in a Picture

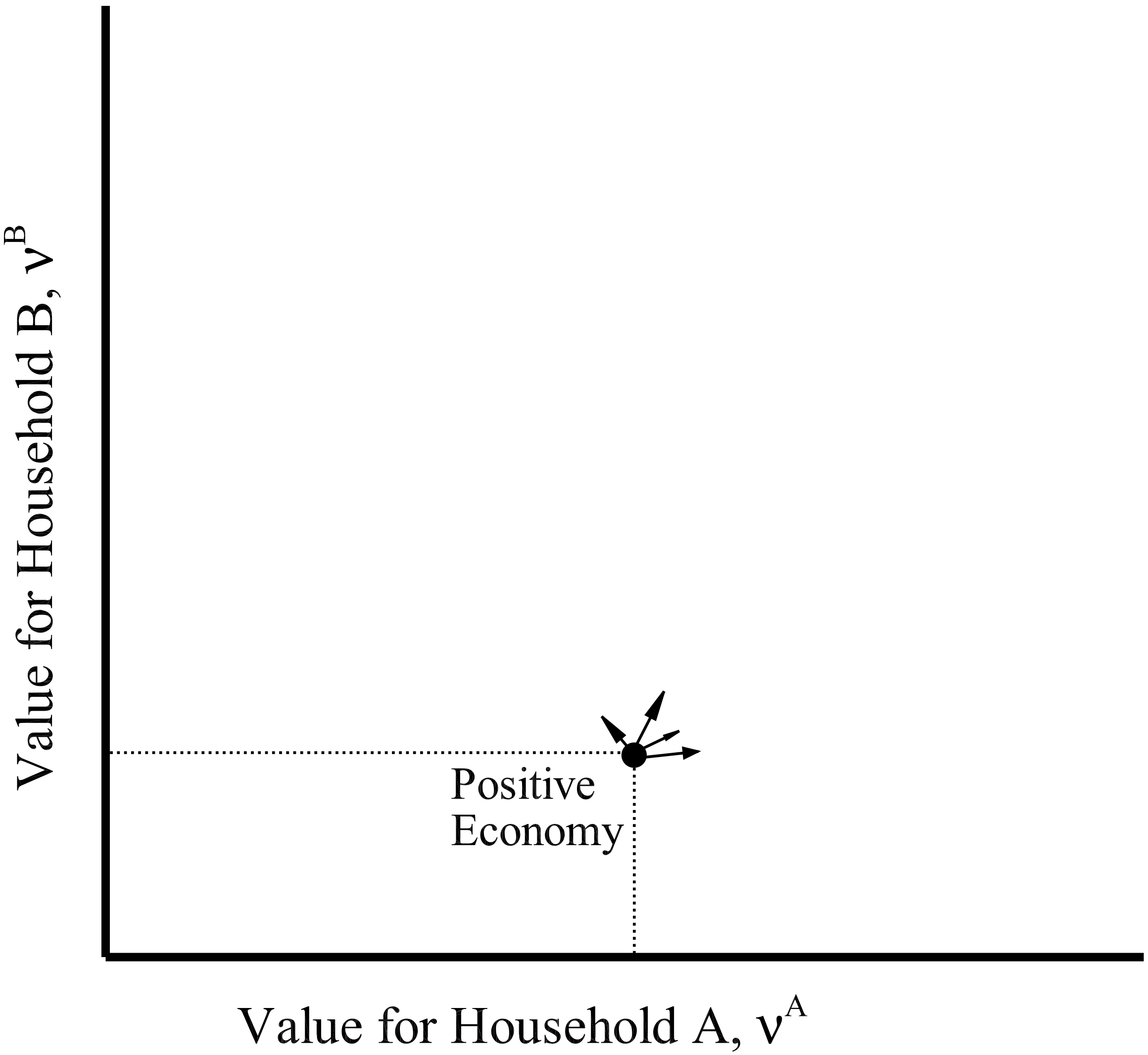


Idea in a Picture

- 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

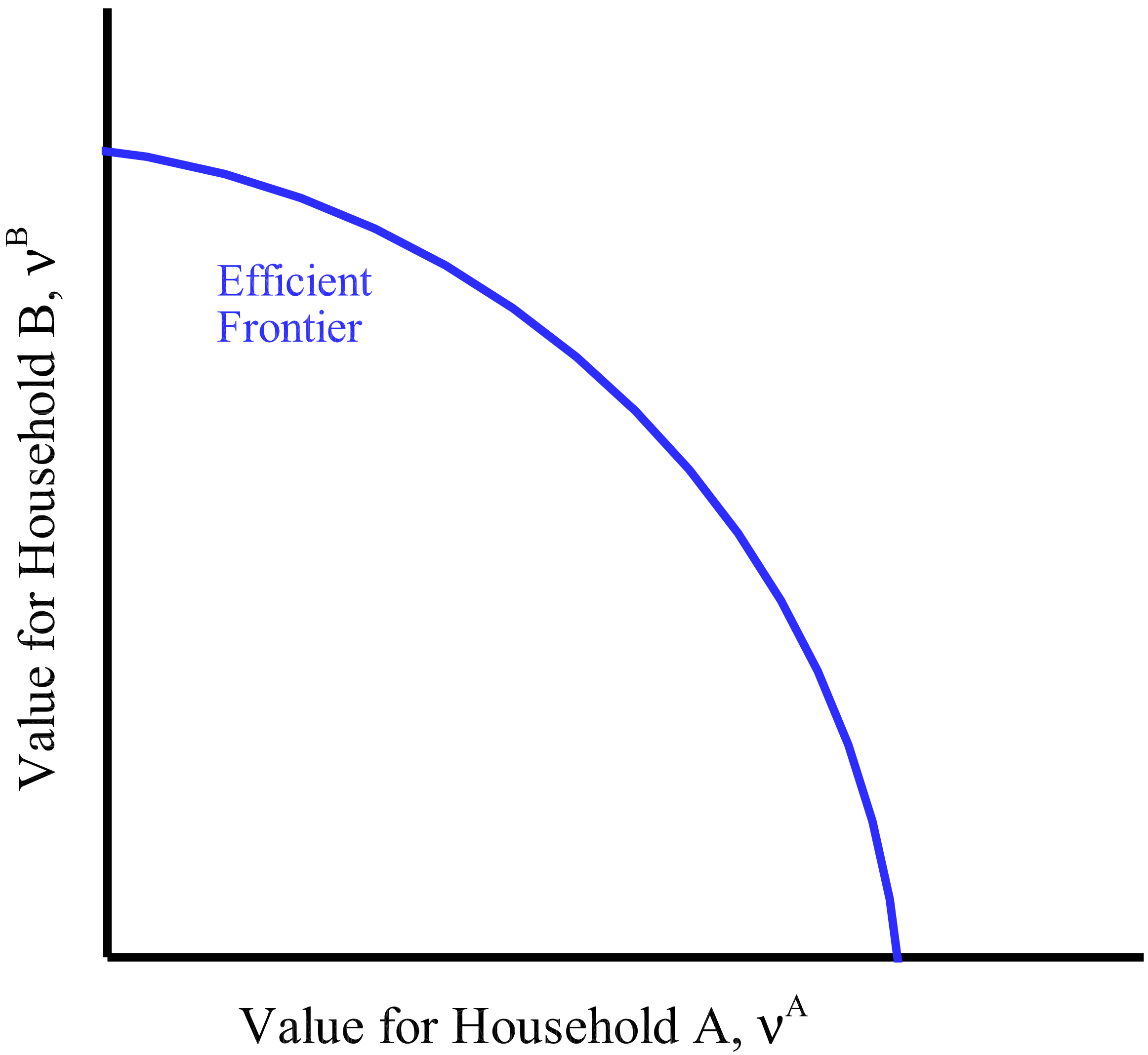


Idea in a Picture

- 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

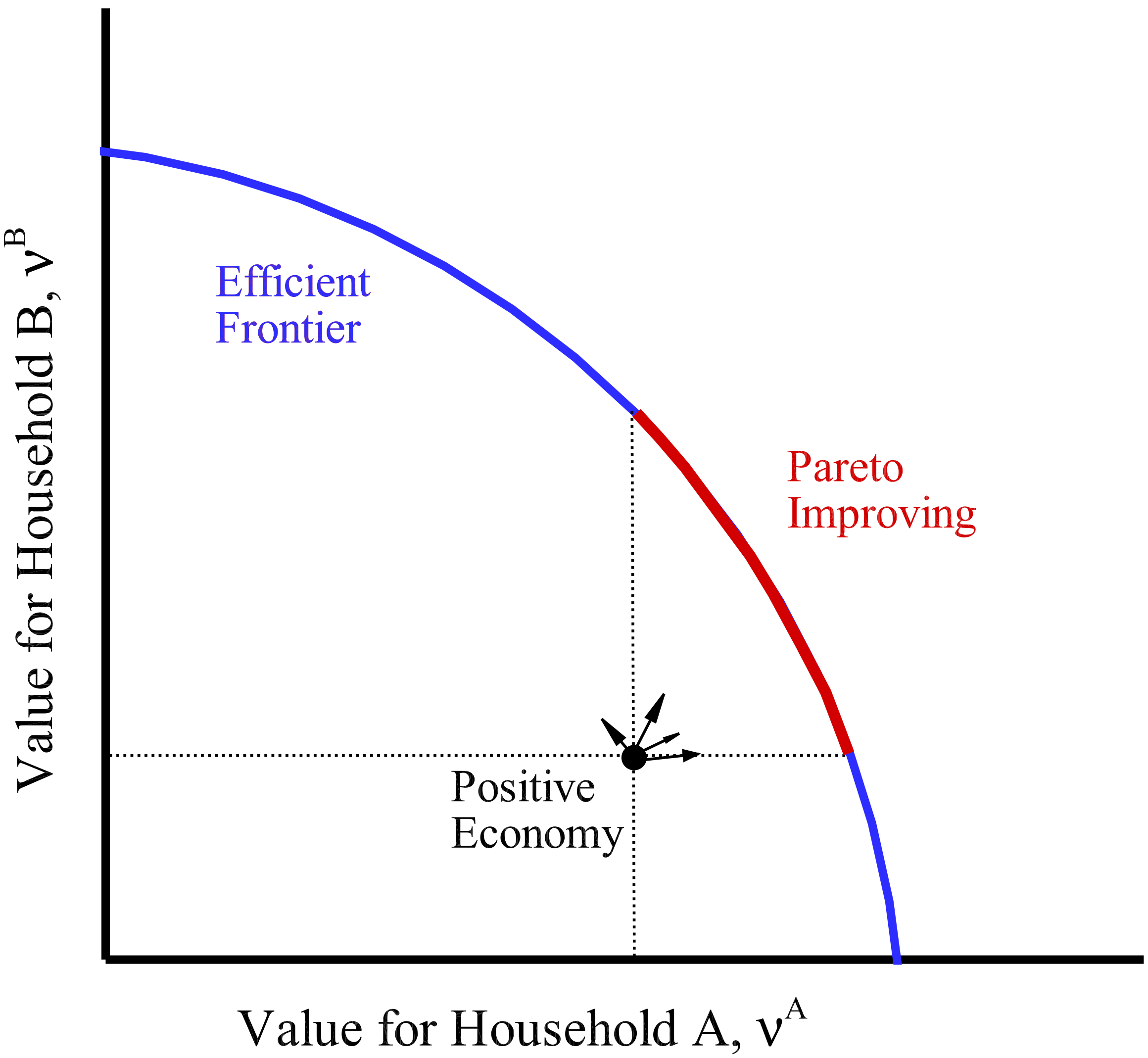


Idea in a Picture

- This paper quantifies gains from:
  - Full Pareto-improving reform a la Mirrlees
  - Partial Pareto-improving reform a la Ramsey
  - Adding early-life transfer informed by Mirrlees

- Let's draw this in the picture

Idea in a Picture



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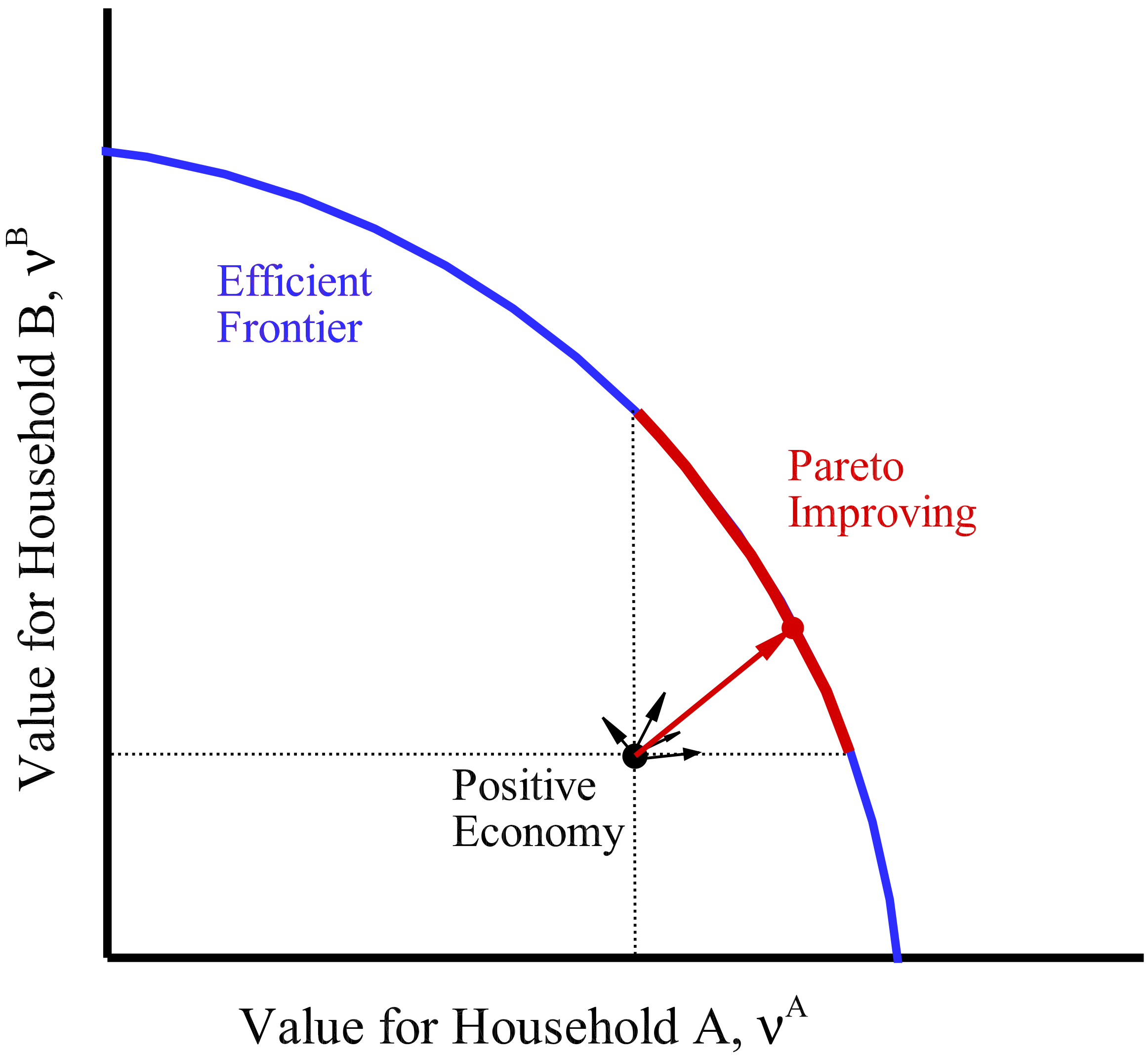

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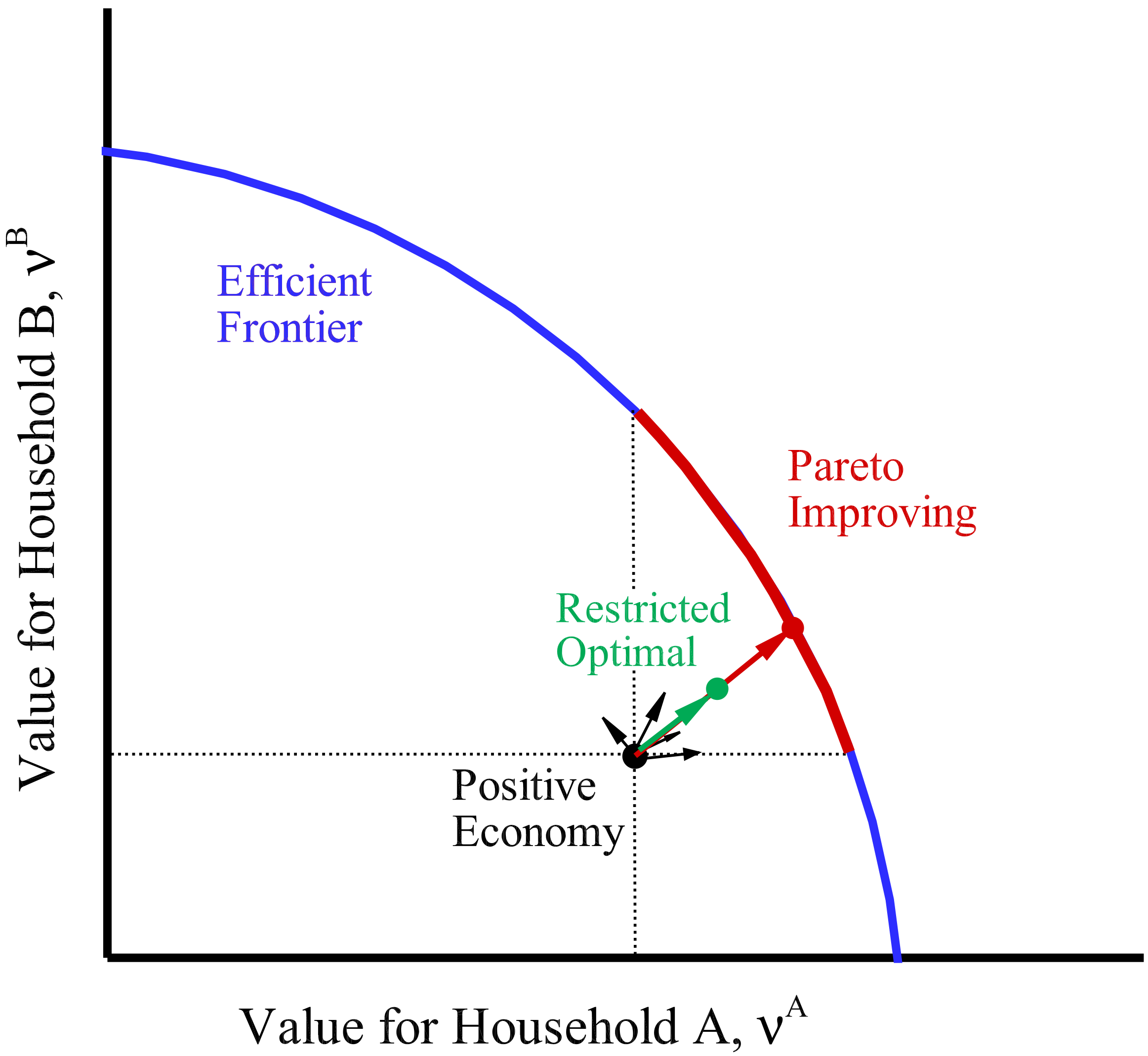

Our Approach

- Solve equilibria 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 (●)

Main Findings

- Maximum consumption equivalent gains (future cohorts):
  - 21% for baseline parameterization (●)
  - 5% attained with current policies (●→)
  - 7% attained with early-life transfer (●)
- Decompose by comparing allocations:
  - Consumption: level ↑ and variance ↓ for all groups
  - Leisure: level ↓ and variance ↑ for all groups

Note: Working on computing gains for *all* cohorts

Main Findings

- Maximum consumption equivalent gains (future cohorts):
  - 21% for baseline parameterization (●)
  - 5% attained with current policies (still hillclimbing)
  - 7% attained with early-life transfer (still hillclimbing)
- Decompose by comparing allocations:
  - Consumption: level $\uparrow$ and variance $\downarrow$ for all groups
  - Leisure: level $\downarrow$ and variance $\uparrow$ for all groups

Note: Working on computing gains for *all* cohorts

Contributions to Literature

- Theory and application of income tax design (•→)

  ⇒ Using administrative data from NL, go to (•)

- Pareto-improving reforms with fixed types

  Hosseini-Shourideh (2019)

  ⇒ Extend analysis to add dynamic risks

- Theory behind dynamic taxation and redistribution (•)

  Kapicka (2013), Farhi-Werning (2013), Golosov et al. (2016)

  ⇒ Link OLG (•) to planner (•) in full GE

Positive Economy (•)

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

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$\Rightarrow$ Estimated with administrative data for the Netherlands

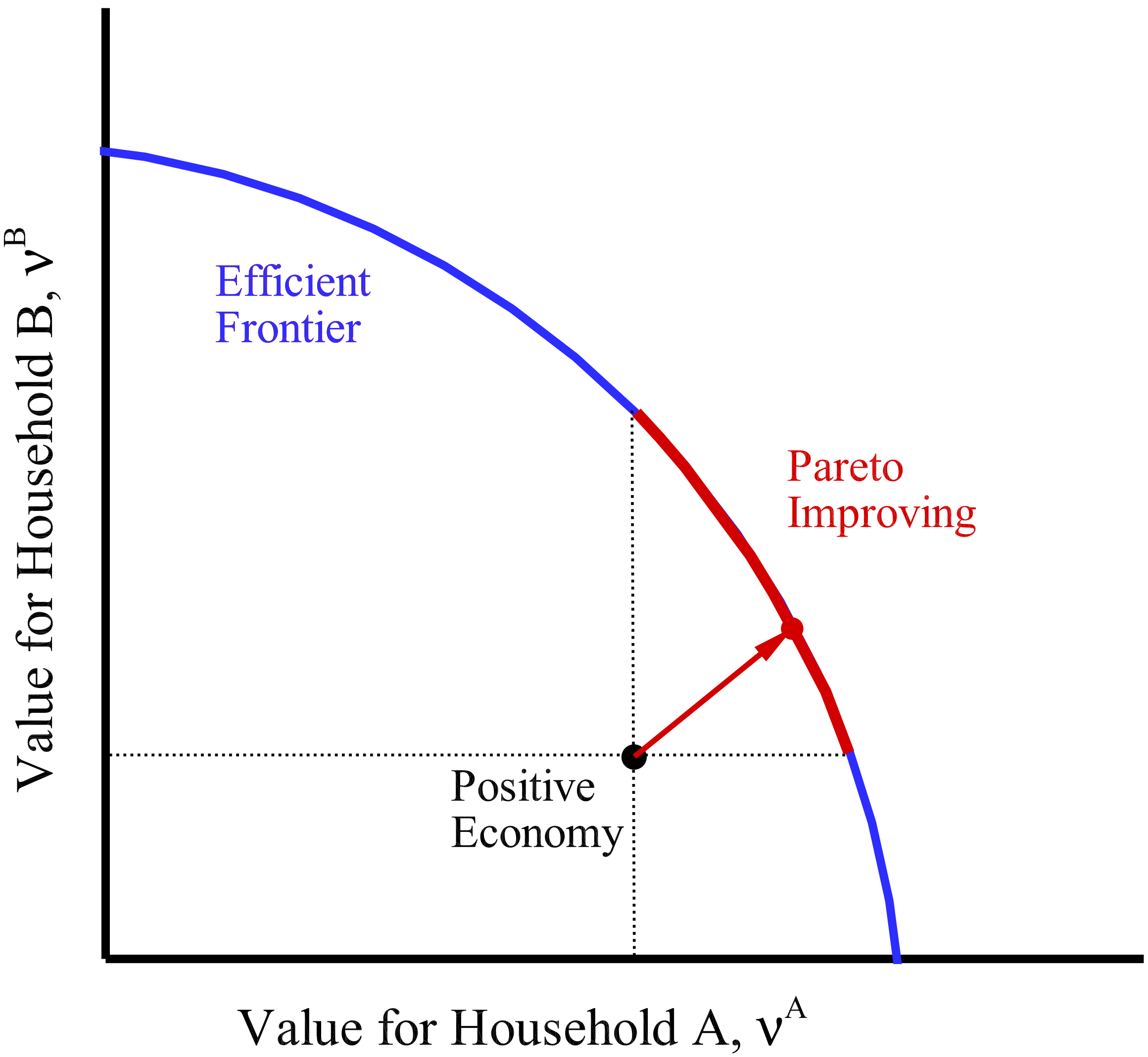
Reform Problem (•)

- Take inputs from positive economy:
  - Parameters of preferences and technologies
  - Wage profiles and shock processes
  - Values under current policy $(v_A, v_B, \ldots)$
- Compute maximum consumption equivalent gain

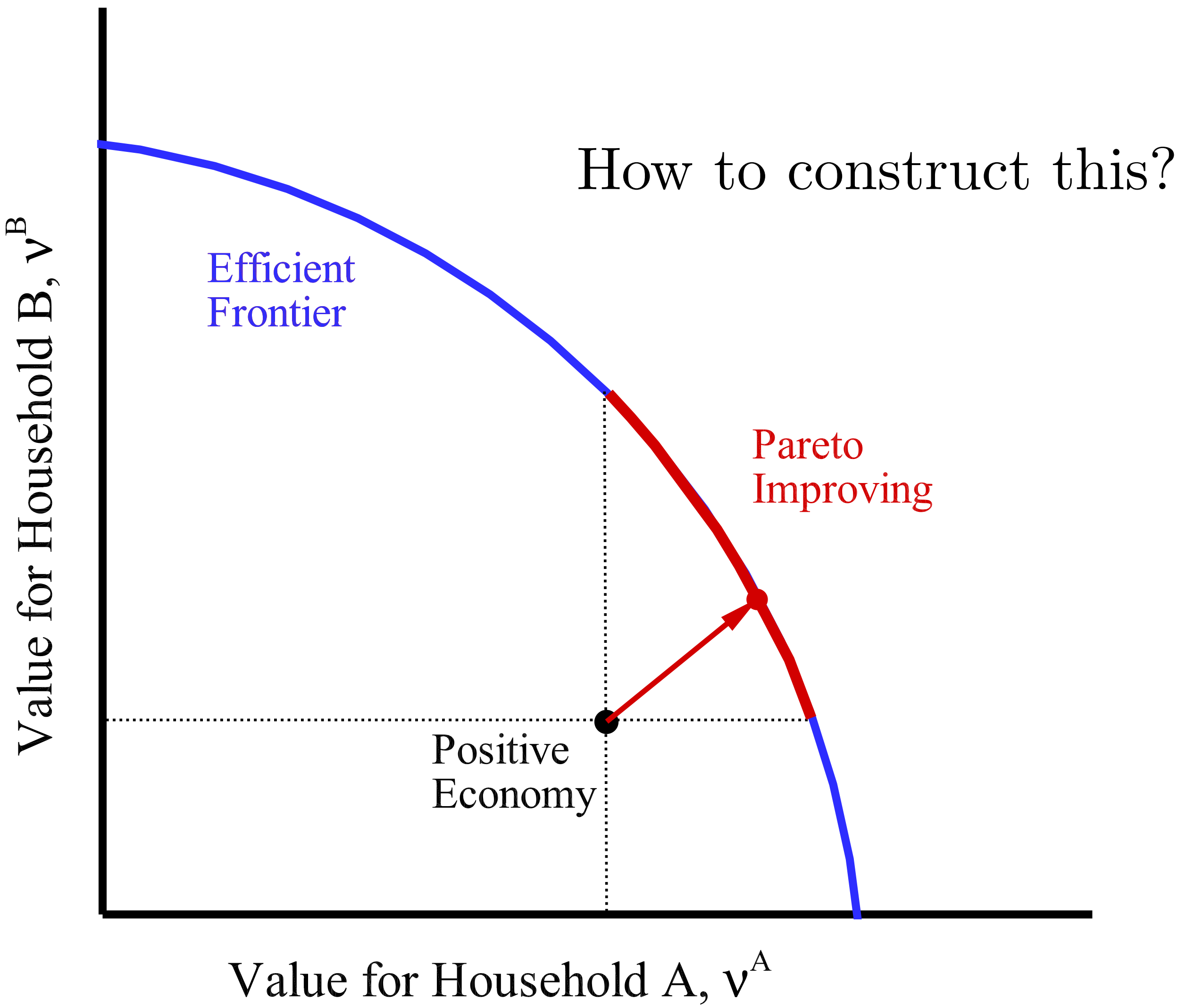
Notion of Efficiency

- Our focus is Pareto-improving reforms:
  - There is no alternative allocation that is
    - Resource feasible (only so much to go around)
    - Incentive feasible (induces truthful reports)
  - Making all better off and some strictly better off
- Will report gain assuming same percentage for all

Pareto-improving Reforms



Pareto-improving Reforms



Planner Problem in Words

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

- GE: total resources $\leq$ to that in positive economy

Planner Problem in Practice

- Exploit separability to solve household by household
- Include only local downward incentive constraints
- Verify numerically that all ICs satisfied
- Solve recursively by introducing additional states:
  - Promised value for truth telling
  - Threat value for local lie

Planner Problem Deliverables

- Welfare gains
  - Total consumption equivalent
  - Decomposition
- Wedges

Note: Working on sensitivity of planner results

Netherlands

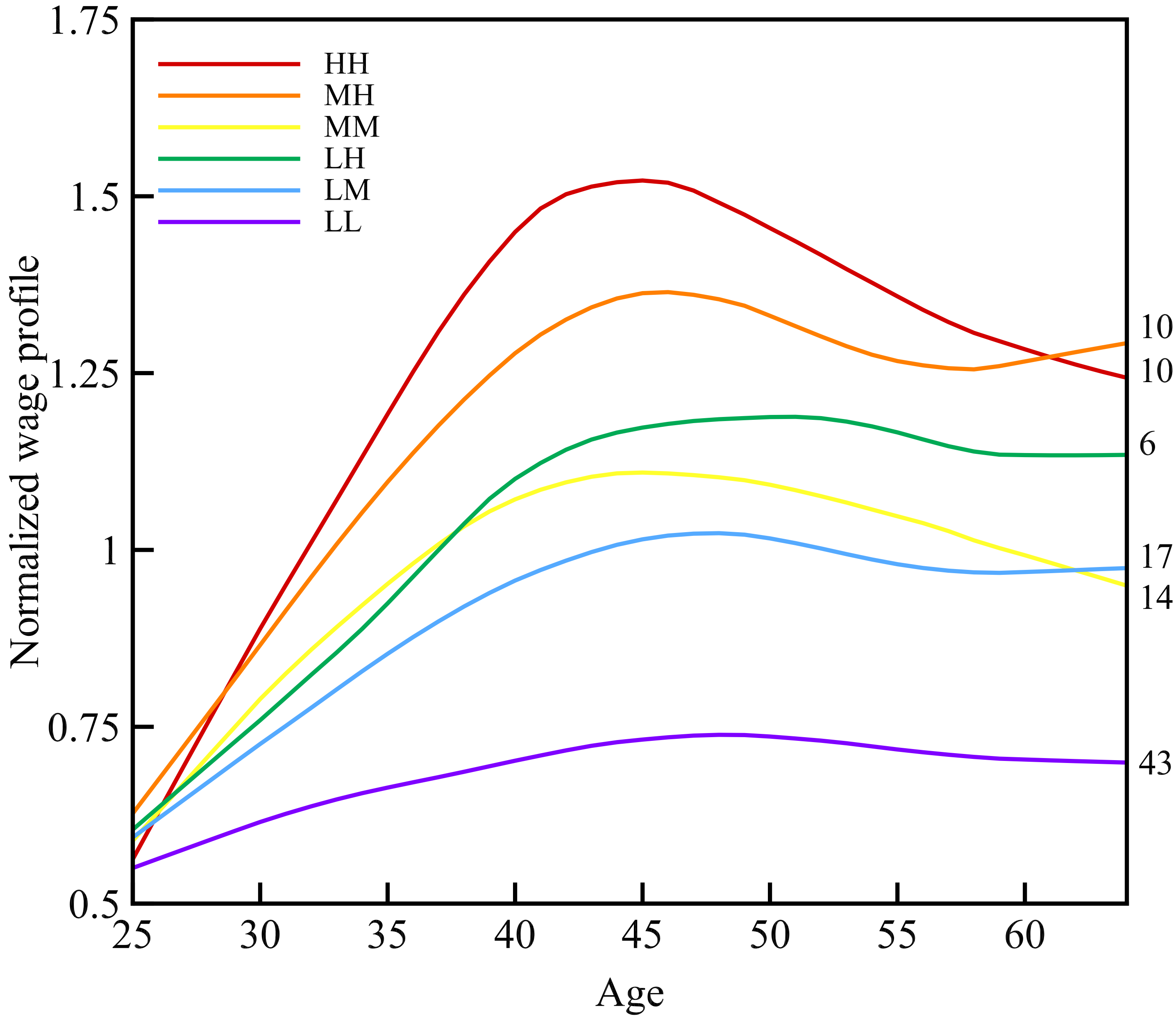
- Merged administrative data, 2006-2014
  - Earnings from tax authority
  - Hours from employer provided data
  - Education from population survey
- National accounts
- Tax schedules

Note: Big advantage is data for computing 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)
- Bin households into 6 groups (HH,HM,...)
- Construct residual wages ω_{ijt}:
  - $\log W_{ijt} = A_t + X_{ijt} + \omega_{ijt}$
  - Estimate AR(1) process for idiosyncratic risk

Wage Profiles



(See paper for estimated wage processes)

An Aside

- Government:
  - Can *ex-post* infer type from choices
  - Can't *ex-ante* observe type
- But, can design policy to *induce* truthful reporting of type

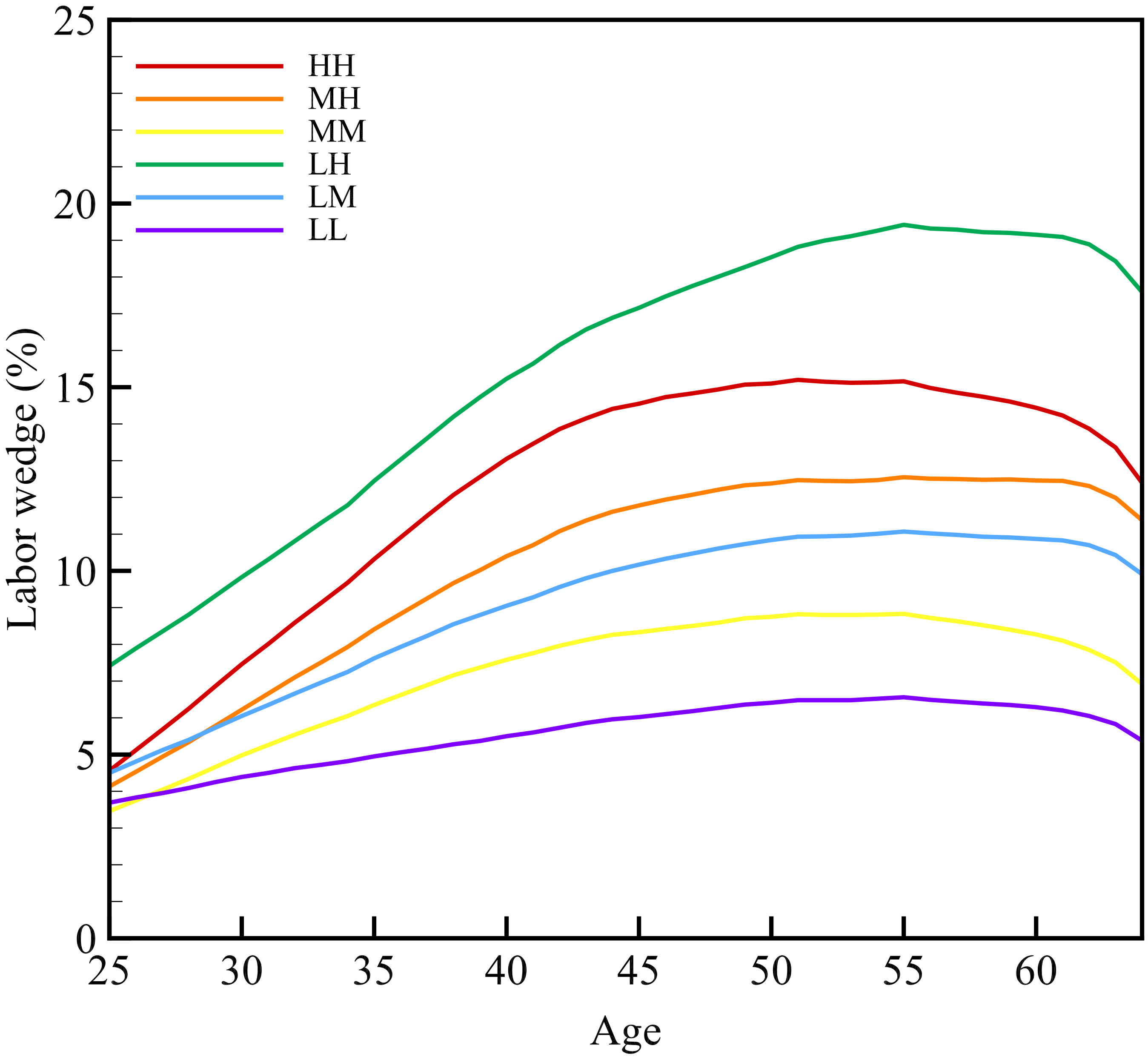
Other Key Parameters

- Number of productivity types
- Preferences
- Status quo policy

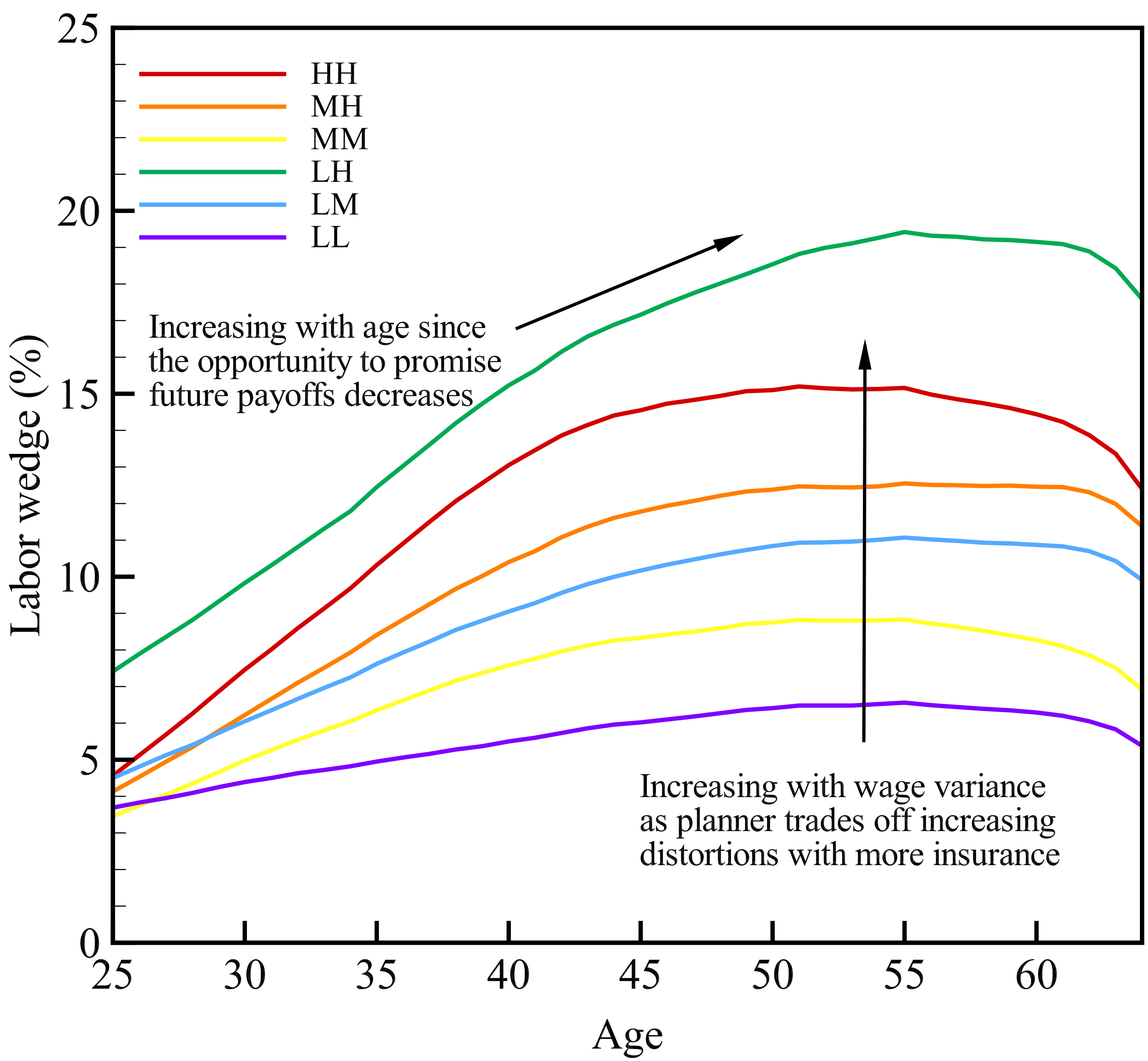
Baseline: 20 types, log preferences, NL wages & policy

Results

Labor Wedges



Labor Wedges



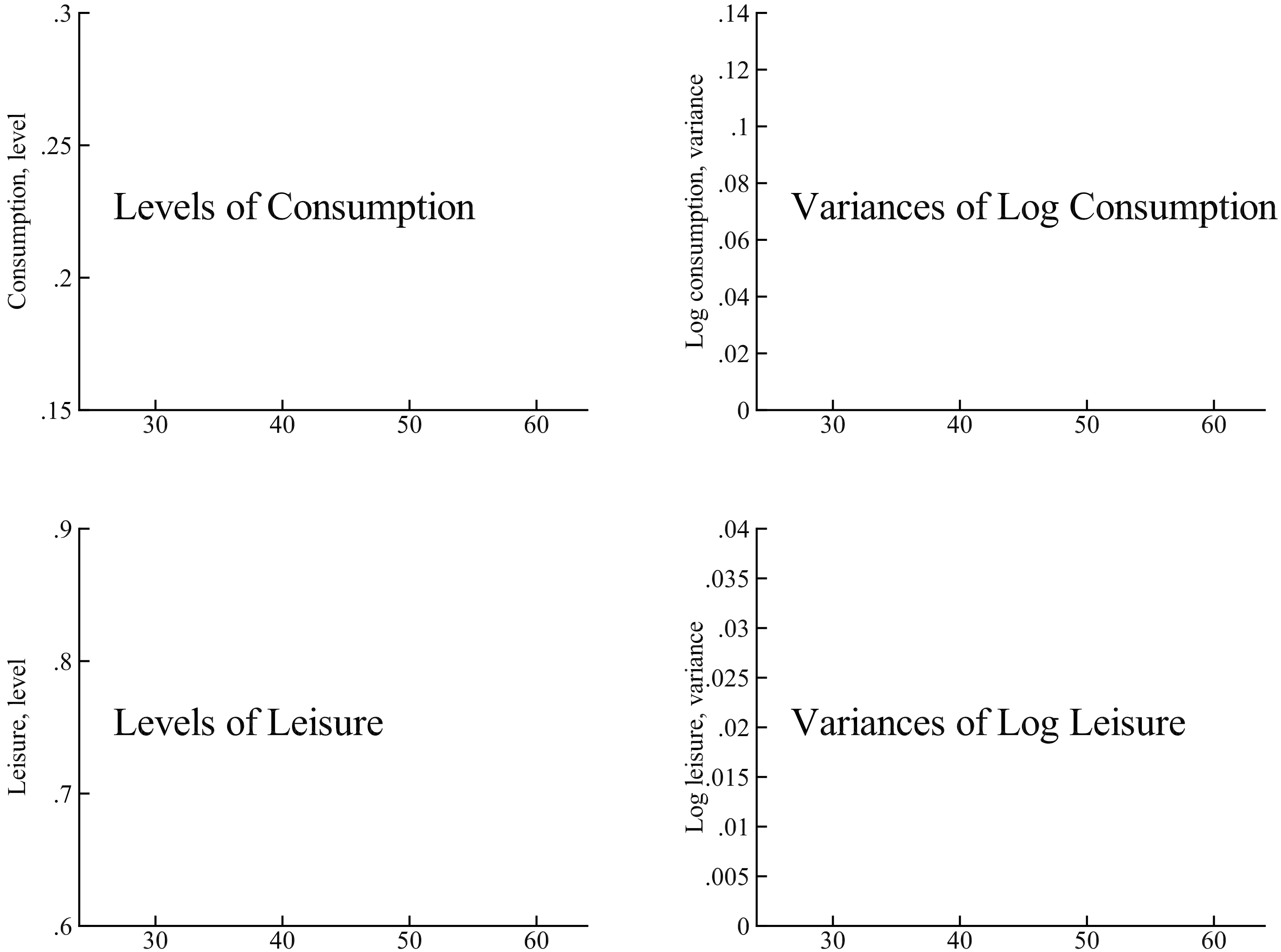
Welfare, (•) vs (•)

- Consumption equivalent gain of 21% for future cohorts
- Large but maybe not surprising given:
  - Tax rates in NL over 40%
  - Tax wedges of planner in 4% to 20% range

Comparing Allocations, (•) vs (•)

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

A Look Under the Hood: Group LL



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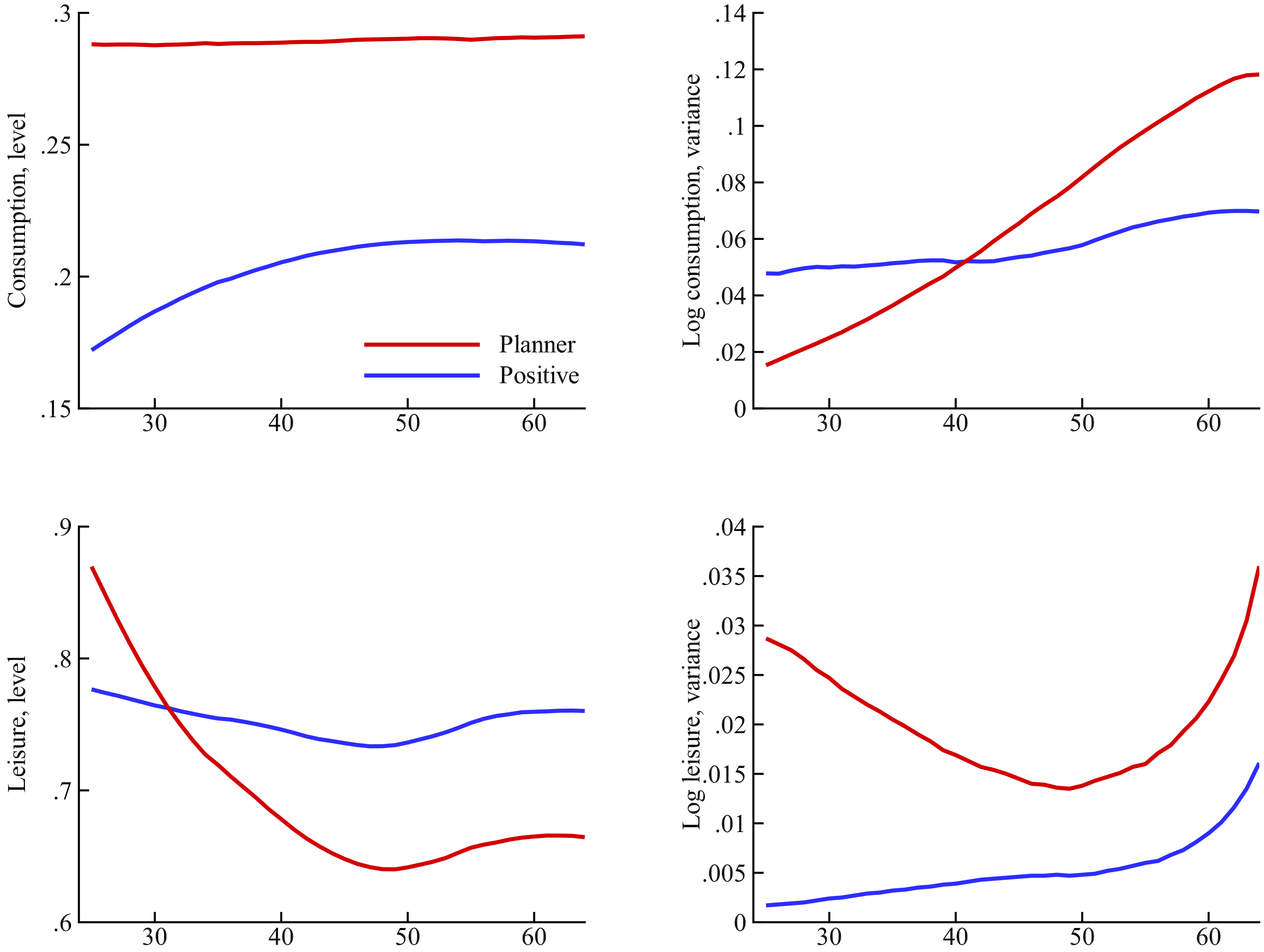
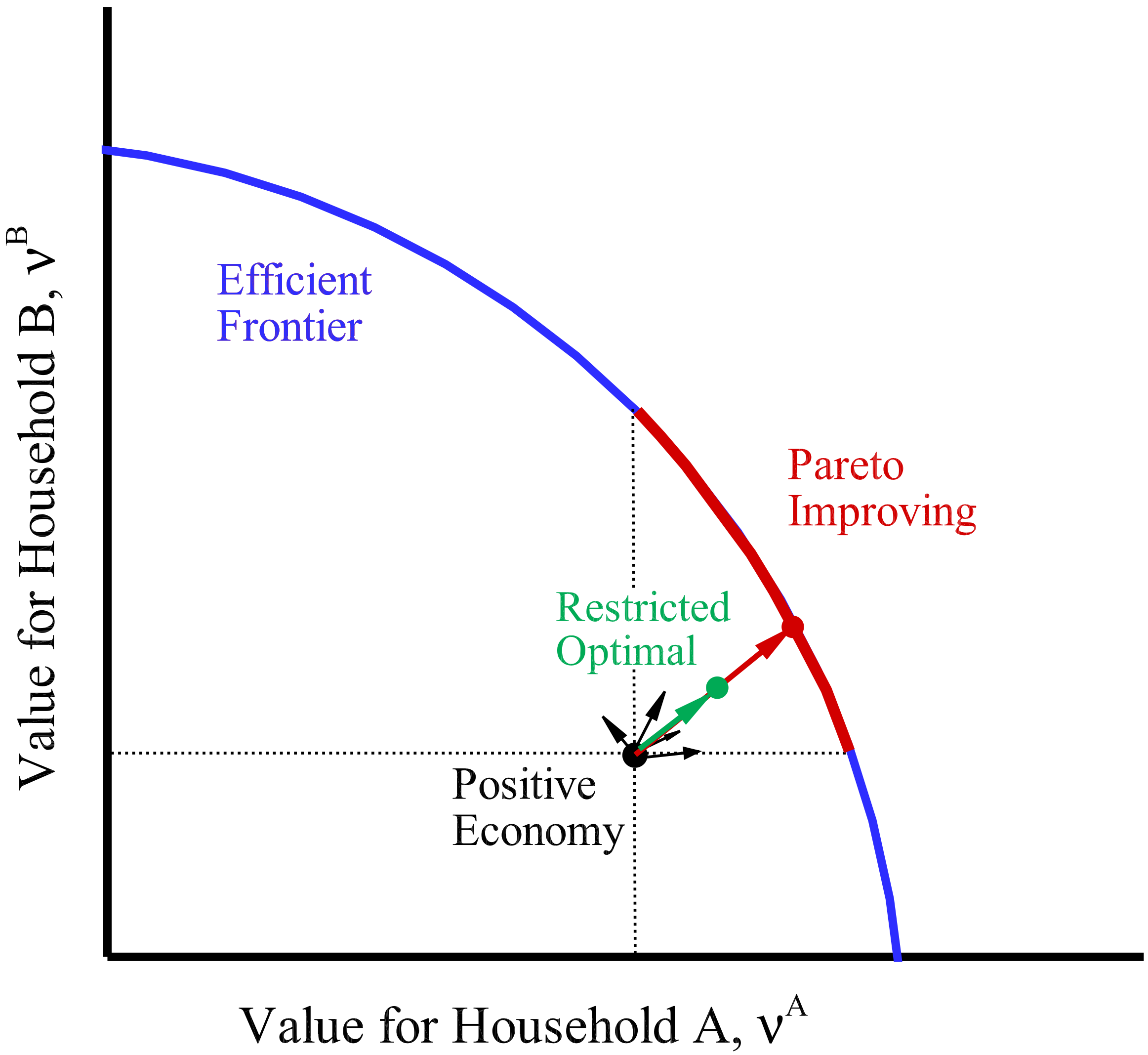


Informing Counterfactuals (●)



Informing Counterfactuals (●)

- Main source of gains:
  - Increased consumption early in life
- Suggests large gains to early-life transfer
  - Without it, found restricted gains of 5%
  - With it, found restricted gains of 7%

out of total of 21%

Note: Estimates of restricted gains still tentative

Summary

- Ultimate goals of project:
  - Estimates of gains for efficient reform
  - Identification of sources of gains
  - Ideas for new policy instruments
  - Prototype for future analyses
- Stay tuned...

Mathematical Appendix

Positive Economy: Household

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

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

where

j= age

a= financial assets

ϵ= productivity shock

Ω= factor prices and tax policies

c= consumption

n= labor supply $(n + \ell = 1)$

Planner Problem for a Household

Planner Problem for a Household

Max present value of resources

Planner Problem for a Household

$$\Pi_j(V, \tilde{V}, \epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon) \Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i)$$
$$+ \Pi_{j+1}(V_j(\epsilon_i), \tilde{V}_j(\epsilon_{i+1}), \epsilon_i)/R \Big]$$

Planner Problem for a Household

$$\Pi_j(V, \tilde{V}, \epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i) + \Pi_{j+1}(V_j(\epsilon_i), \tilde{V}_j(\epsilon_{i+1}), \epsilon_i)/R\Big]$$

s.t. Local downward incentive constraints

Planner Problem for a Household

$$\Pi_j(V,\tilde{V},\epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i)$$

$$+\Pi_{j+1}(V_j(\epsilon_i),\tilde{V}_j(\epsilon_{i+1}),\epsilon_i)/R\Big]$$

$$\text{s.t.} \quad U(c_j(\epsilon_i),\ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)$$

$$\geq U(c_j(\epsilon_{i-1}),\ell_j^+(\epsilon_{i-1})) + \beta \tilde{V}_j(\epsilon_i), \;\; i \geq 2$$

where $\ell_j^+(\epsilon_{i-1}) = 1 - n_j(\epsilon_{i-1})\epsilon_{i-1}/\epsilon_i$

Planner Problem for a Household

$$\Pi_j(V,\tilde{V},\epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i) + \Pi_{j+1}(V_j(\epsilon_i),\tilde{V}_j(\epsilon_{i+1}),\epsilon_i)/R\Big]$$

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Deliver at least the promised value

Planner Problem for a Household

$$\Pi_j(V,\tilde{V},\epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i) \\ + \Pi_{j+1}(V_j(\epsilon_i),\tilde{V}_j(\epsilon_{i+1}),\epsilon_i)/R\Big]$$

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$$\geq U(c_j(\epsilon_{i-1}),\ell_j^{+}(\epsilon_{i-1})) + \beta\tilde{V}_j(\epsilon_i), \;\; i \geq 2$$

$$V \leq \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\left[U(c_j(\epsilon_i),\ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)\right]$$

Planner Problem for a Household

$$\Pi_j(V,\tilde{V},\epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i) + \Pi_{j+1}(V_j(\epsilon_i),\tilde{V}_j(\epsilon_{i+1}),\epsilon_i)/R\Big]$$

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$$V \leq \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\left[U(c_j(\epsilon_i),\ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)\right]$$

Deliver no more than the threat value

Planner Problem for a Household

$$\Pi_j(V,\tilde{V},\epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i) + \Pi_{j+1}(V_j(\epsilon_i),\tilde{V}_j(\epsilon_{i+1}),\epsilon_i)/R\Big]$$

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$$V \leq \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\left[U(c_j(\epsilon_i),\ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)\right]$$

$$\tilde{V} \geq \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon^+)\left[U(c_j(\epsilon_i),\ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)\right]$$

Planner Problem for Future Generation ($j = 1$)

$$\Pi_j(V, -, \epsilon) \equiv \max \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon)\Big[w\epsilon_i n_j(\epsilon_i) - c_j(\epsilon_i)$$
$$+\Pi_{j+1}(V_j(\epsilon_i), \tilde{V}_j(\epsilon_{i+1}), \epsilon_i)/R\Big]$$

s.t. $U(c_j(\epsilon_i), \ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)$

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No threat value

Planner Problem for Future Generation ($j = 1$)

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$$V \leq \sum_{\epsilon_i} \pi_j(\epsilon_i|\epsilon) \left[U(c_j(\epsilon_i), \ell_j(\epsilon_i)) + \beta V_j(\epsilon_i)\right]$$

Replace arbitrary V with $\vartheta(\epsilon_0) + \vartheta_\Delta$