Universal Basic Income: Inspecting the Mechanisms

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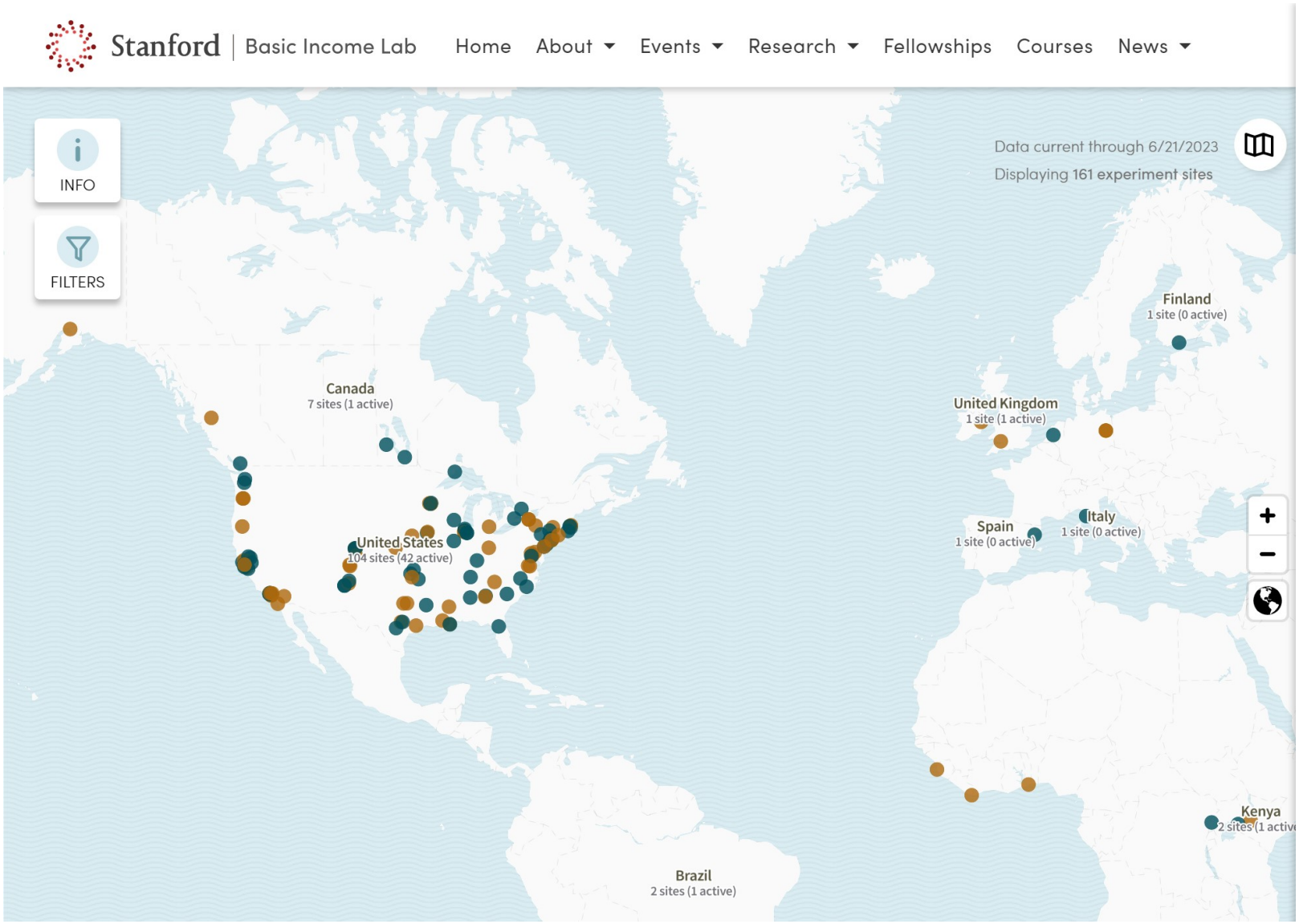
Overview

- UBI is heavily debated in policy circles and across media outlets
  - e.g., Andrew Yang's signature policy in his presidency campaign (2020)
- It provides a safety net for everyone:
  - potentially less distortions than classical welfare,
  - but very costly $\Rightarrow$ requires dramatic changes to taxation
- The case of Denmark:
  - The cost is already there
  - But should they do it?
- Back to the US:
  - Are means test benefits the jack pot we're looking for?

Motivation

- Many small scale programs provide insights on cash-assistance benefits

Motivation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Data current through 6/21/2023
Displaying 161 experiment sites
Canada
7 sites (1 active)
United States
104 sites (42 active)
Finland
1 site (0 active)
United Kingdom
1 site (1 active)
Spain
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Italy
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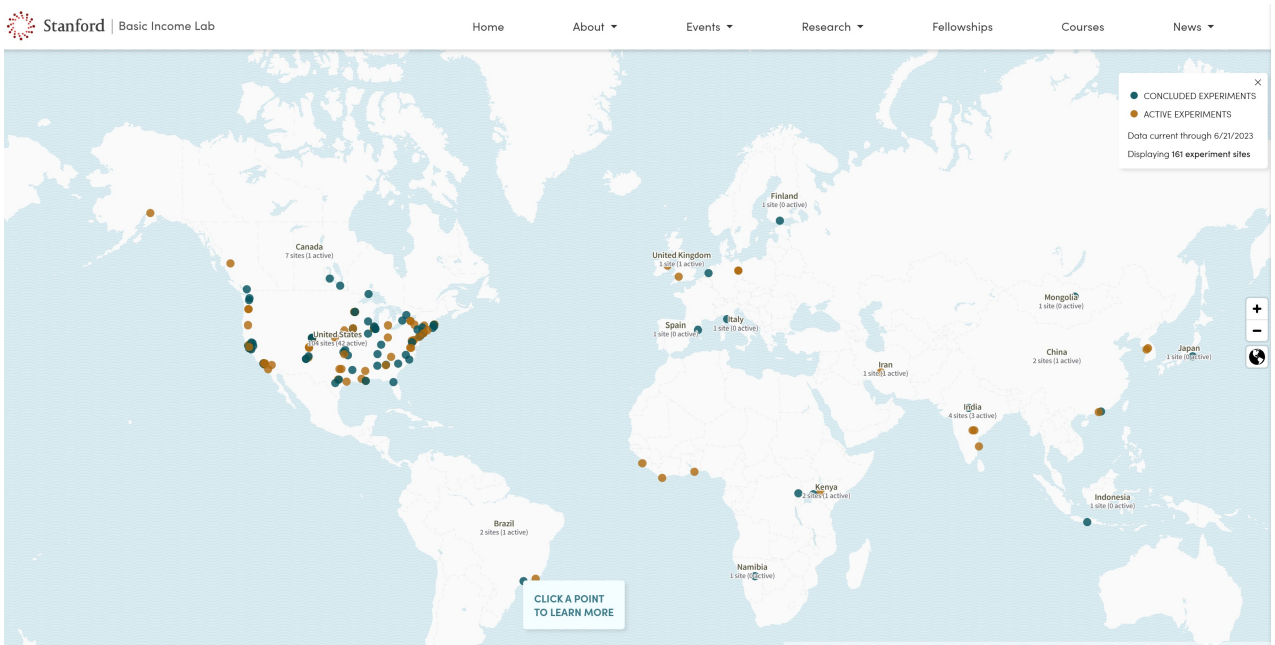
Kenya
Brazil
2 sites (1 active)

Motivation

- Many small scale programs provide insights on cash-assistance benefits



- Lack of aggregate level and long-term commitment limit discussion on:
  - How UBI could be funded and what are the macro implications?
  - How would UBI interact with other sources of government assistance?
  - How the costs and benefits would stack up?

In this paper

- Goal: underscore qualitatively and quantitatively the key mechanisms through which UBI affects the economy
- A rich model to study many UBI programs and financing schemes:
  - **Cost:** labor force participation, demand for capital and unemployment
  - **Insurance role:** incomplete markets with self-insurance, individual productivity & employment shocks
  - **Policy side:** labor & capital income distortionary taxation, as well as social insurance programs
- Three alternative implementations:
  - Keep progressivity and social assistance fixed
  - Alternative funding: change progressivity
  - Alternative design: partially phase out social assistance

The key takeaways

Holding progressivity and social assistance fixed:

- A large decline in labor force participation, capital, and output
- Three main channels:
  1. Increased taxation lowers labor force participation (substitution)
  2. Reduced demand for self insurance decreases capital (insurance)
  3. The grant lowers labor force entry (income)
- Also lowers inequality but not enough to offset the cost

Alternative funding - change progressivity:

- UBI can only be justified as an alternative to progressive taxation

Alternative design - partially phase out social assistance:

- A modest level of UBI increases labor force and can be welfare enhancing

Related literature

- **Heterogeneous agents and Public Policy**: Krusell, Mukoyama, and Sahin (2010), Holter, Krueger and Stepanchuk (2019), Setty, and Yaniv Yedid-Levi (2020)

- **Empirical UBI**: Hsieh (2003), Akee et al. (2010, 2013, 2018), Kueng (2018), Jones and Marinescu (2022) + Many local policy reports

- **The Macroeconomics of UBI**: Daruich and Fernandez (2023), Guner, Kaygusuz and Ventura (2023), Conesa, Li and Li (2023), Luduvice (2019)

Also: Hoynes and Rothstein (2019) and Van Parijs and Vanderborght (2017)

Plan for this talk

- Model
- Calibration and model fit
- Results
  - Keeping progressivity and social assistance fixed
  - Alternative funding: change progressivity
  - Alternative design: partially phase out social assistance

Model

Key ingredients

- Model set up:
  - Heterogeneous-agents, incomplete markets model with search-and-matching as in the spirit of Krusell, Mukoyama and Sahin (2010)
  - Plus productivity shocks, similar to Setty and Yedid-Levi (2020)
  - Plus endogenous labor force participation
- Government:
  - Funds payments to workers outside the labor force, unemployment benefits, government expenditures, and UBI
  - Taxes labor and capital income
- General equilibrium endogenous variables: assets' return rate, assets' distribution, wages, and job-finding rate
- Steady state comparison (plus transition for one case)

Within the Labor Force

- Workers who participate in the labor force are employed/unemployed
- Firms maintain vacancies v that cost ξ per vacancy
- All unemployed workers (u) search for work
- A constant-returns-to-scale matching function $\chi \times M(v, u)$
- Define market tightness as: $\theta = \frac{v}{u}$, accordingly:
  - Job-finding probability $\lambda^w(\theta)$ (Strictly increasing)
  - Vacancy-filling probability $\lambda^f(\theta)$ (Strictly decreasing)
- Matches separate at a constant and exogenous probability s each period
- Everyone exit with probability ϕ

Productivity and production

Workers

- Individuals draw persistent productivity p according to:

$$\log(p_t) = \rho \log(p_{t-1}) + \epsilon_{p,t},$$

  where $\epsilon_{p,t}$ is i.i.d., mean zero, s.d. σ_{ϵ_p}

- Workers keep p upon unemployment, and re-draw upon re-employment

Firms

- Produce an identical good
- Rent capital $k(p)$, pay wage w
- Produce using a standard (per worker) production function:

$$p \times f(k(p)), \qquad f' > 0, \quad f'' < 0$$

Assets

- Two assets: capital (k) and claims on firms' aggregate profits (equity: x)
- No arbitrage implies the same return ($1 + r - \delta = \frac{d+\pi}{\pi}$), where:
  - d is dividends
  - π price of equity
  - r rental rate of capital
  - δ depreciation rate
- Indifferent between k and $x \rightarrow$ define total assets a as the worker's state .

Government transfers and taxes

- Government transfers and expenditures:
  - Social assistance for those outside the labor force (b^{NLF})
  - Unemployment insurance (replacement rate h, capped at κ)
  - Government expenditure (G, fixed)
  - Universal basic income (UBI)
- Financed through:
  - Progressive labor taxation, with tax rate : $t_l(y_l) = 1 - \lambda_l \left(y_l/\bar{y}_l\right)^{-\tau_l}$

    y_l: income (wage or unemployment benefits)

    $\bar{y}_l$: average income

    $1 - \lambda_l$: tax rate levied on average income

    τ_l: progressivity level ($\tau_l = 0$ is a flat tax rate)

    Note: this specification allows for Earned Income Tax Credit (EITC)
  - Flat tax rate on capital income t_a
- Balanced budget

Decisions 1/5: Labor force participation

- Workers are born outside the labor force with utility cost $\Gamma \sim \mathcal{N}(\mu_\Gamma, \sigma_\Gamma^2)$
- If enters the labor force:
  - Pays the utility cost Γ
  - Starts unemployed and with the lowest productivity $\underline{p}$
- If stays outside the labor force:
  - Receives periodic social assistance (b^{NLF}) plus UBI
  - No assets' accumulation (for simplicity)
  - This yields the value $V^{NLF} = \frac{u(b^{NLF}+UBI)}{1-\beta(1-\phi)}$
- Entry decision is thus: $\max\{V^{NLF}, U(0, \underline{p}) - \Gamma\}$

  $\Rightarrow$ a cutoff cost Γ^*, s.t. $\Gamma < \Gamma^*$ enters the labor force

Decisions 2/5: Employed Worker's consumption-savings

$$
\begin{aligned}
W(a,p) \quad &= \quad \max_{c,a'} \left\{ u(c) + \beta(1-\phi) \left[sU\left(a', p\right) + (1-s)\,\mathbb{E}\left[W\left(a', p'\right) \right] \right] \right\} \\
\text{s.t.} \quad &: \\
& \quad c + qa' = w(a,p)\left(1 - t_l\left(w(a,p)\right)\right) + a\left(1 - t_a \times (1-q)\right) + UBI \\
& \quad a' \geqslant 0
\end{aligned}
$$

where:

- a' denotes the optimal policy for assets
- $q \equiv \frac{1-\phi}{1+r-\delta}$ denotes $1/$gross return
- $(1-q)\,a$ is flow asset income

Decisions 3/5: **Unemployed** Worker's consumption-savings

$$
\begin{aligned}
U(a,p) \quad &= \quad \max_{c,a'} \left\{ u(c) + \beta(1-\phi) \left[(1-\lambda^w) U(a',p) + \lambda^w \mathbb{E}\left[W(a',p') \right] \right] \right\} \\
\text{s.t.} \quad &: \\
& \quad c + qa' = b(p)\left(1 - t_l\left(b(p)\right)\right) + a\left(1 - t_a \times (1-q)\right) + UBI \\
& \quad a' \geqslant 0
\end{aligned}
$$

where:

- $b(p) = \min\{h\overline{w}(p), \kappa\}$

Decisions 4-5/5: Firms' vacancies and capital

- A large number of firms post vacancies with a value:

$$V = -\xi + q\left[(1-\lambda^f)V + \lambda^f(1-\phi)\mathbb{E}\left[J(a',p')\right] + \lambda^f\phi V\right],$$

- With free entry, in equilibrium, firms post new vacancies until $V = 0$
- A filled job with a worker with assets a, and productivity p has the value:

$$J(a,p) = \max_{k(p)}\{pf(k(p)) - rk(p) - w(a,p)$$
$$+ q(1-\phi)\left[sV + (1-s)\mathbb{E}\left[J(a',p')\right]\right] + q\phi V\}$$

Wages

- Wages are determined by Nash bargaining.
- Solution is a set of wage functions $w_i(a, p)$ that solve:

$$\max_{w(a,p)} \left(W(a,p) - U(a,p)\right)^{\gamma} \left(J(a,p) - V\right)^{1-\gamma},$$

where $\gamma \in (0, 1)$ is workers' bargaining power

Full equilibrium specification

Calibration and Model Fit

Calibration

- Calibrate key labor market parameters to match data from the CPS and ASEC 2000-2019
- Main sample restricted to ages 18-65 excluding armed forces
- Exclude three groups not in the labor force, which are unmodeled:
  - Students (everyone outside the labor force under 25)
  - Retirees below the age of 65
  - Married not in the labor force, not receiving social assistance
- The high labor force participation implied by this sample (0.9) choice mitigates the costs associated with the UBI (b/c implies a low dependency ratio)

Calibration of benchmark economy

period	month	
$u(c)$	$\log(c)$	
β	0.9965	match interest rate (3.1% annual)
μ_Λ	-68.51	match the labor force (0.9)
σ_Λ	171.51	match elasticity of NLF w.r.t. social assistance (0.3)
ϕ	0.00029	social security data on death probability
α	0.3	$f(k) = k^\alpha$
δ	0.007	investment/output ratio 0.23
$M(u, v)$	$\chi(u)^\eta v^{1-\eta}$	
χ	0.362	benchmark job finding rate 36.2%
η	0.6	Petrongolo and Pissarides (2001) Brugemann (2008)
γ	0.6	
s	0.022	match unemployment rate of 5.8%

Calibration of benchmark economy

Policy Parameters

λ_l	0.90	Holter, Krueger, and Stepanchuk (2019)
τ_l	0.15	Holter, Krueger, and Stepanchuk (2019)
t_a	0.36	Trabandt and Uhlig (2011)
b^{NLF}	0.90	Match ratio of social assistance to average wage, ASEC (0.17)
h	0.4	replacement rate
κ	1.83	average benefits are 60% of median wage

Model Fit - wealth distribution

- The model reasonably accounts for key wealth-distribution moments
- Especially the bottom Lower two quintiles, who benefit the most of UBI

	Data	Model
% share owned by		
Q1	-0.2	$<$0.05
Q2	1.2	1.5
Q3	4.6	7.4
Q4	11.9	21.5
Q5	82.5	69.5
Gini	0.78	0.68

Model fit - empirical micro evidence

- Use the Alaska Permanent Fund Dividend as external validation:
  - Starting 1982, Alaskans get yearly dividend payment from the fund
  - As UBI: universal, unconditional, permanent but **not funded by taxes**
- Jones and Marinescu (2022) find a decline of less then 1 p.p in full time equivalent labor supply (accounting for part-time work effect)
- **Keeping taxes constant** in our model, gives $\sim$ 0.5 p.p decline in employment

Results I: Inspecting the mechanisms:

progressivity and social assistance unchanged

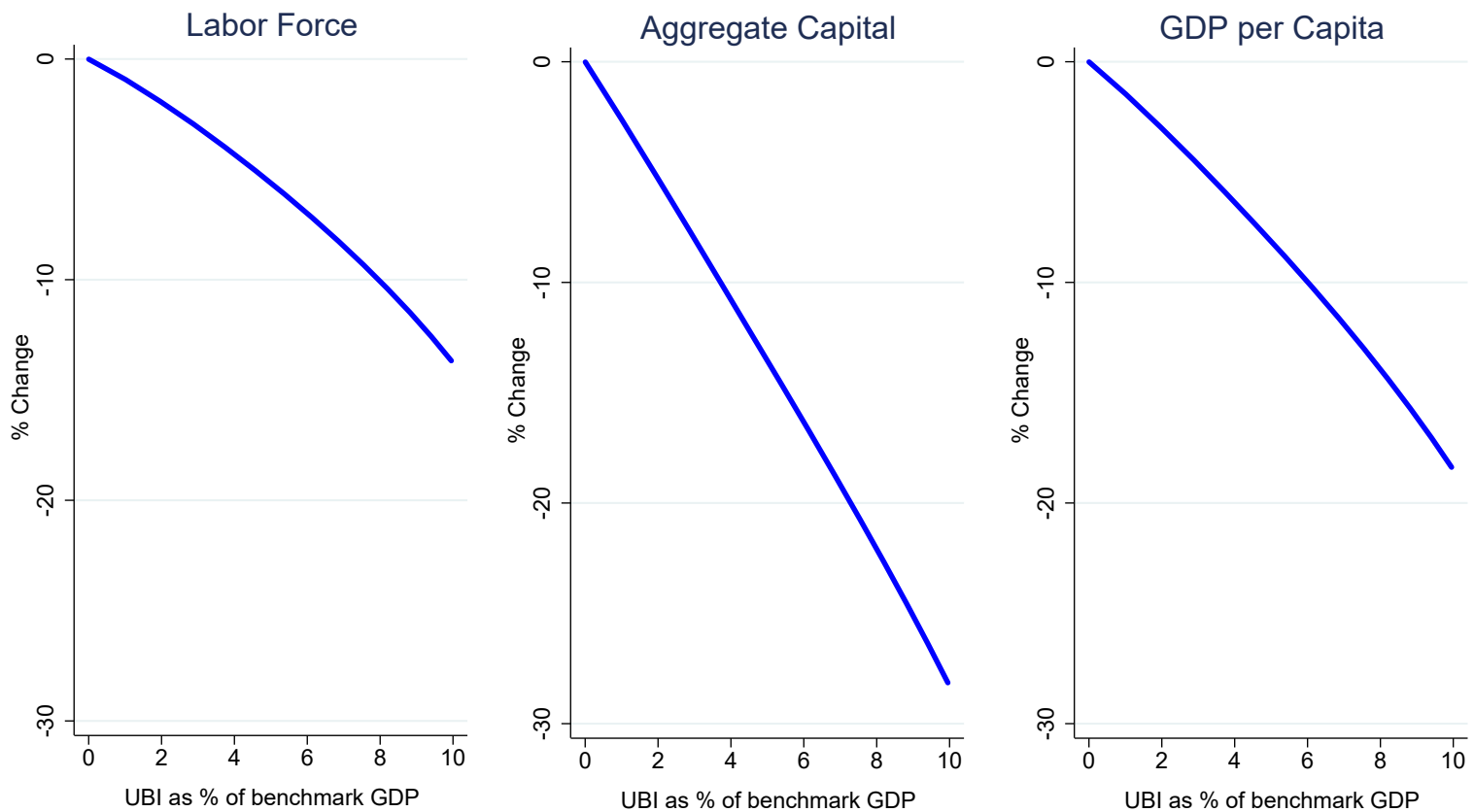
The policy exercise

- Solve for multiple levels of UBI (0 to 10% of baseline GDP per capita)
- Finance UBI by shifting the tax function ($\lambda_l \downarrow$), holding tax progressivity (τ_l) constant:

$$t_l(y_l) = 1 - \lambda_l \left(\frac{y_l}{\bar{y}_l} \right)^{-\tau_l}$$

- Calculate the steady state equilibrium allocations and prices
  - Present results in deviations from the benchmark economy

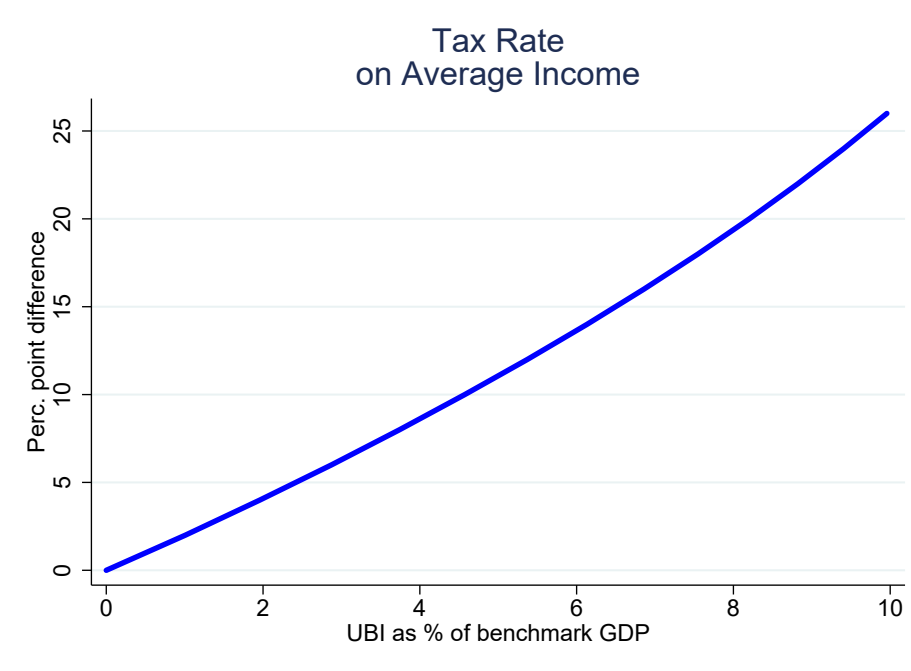
GDP FALLS DRAMATICALLY WITH UBI



Inspecting the mechanisms: first channel

1. **UBI is Expensive**:

   Labor tax rate pushes workers outside the labor force (substitution)



Inspecting the mechanisms: additional channels

1. **UBI is Expensive**:

   Labor tax rate pushes workers outside the labor force (substitution)

2. **UBI provides public insurance** :

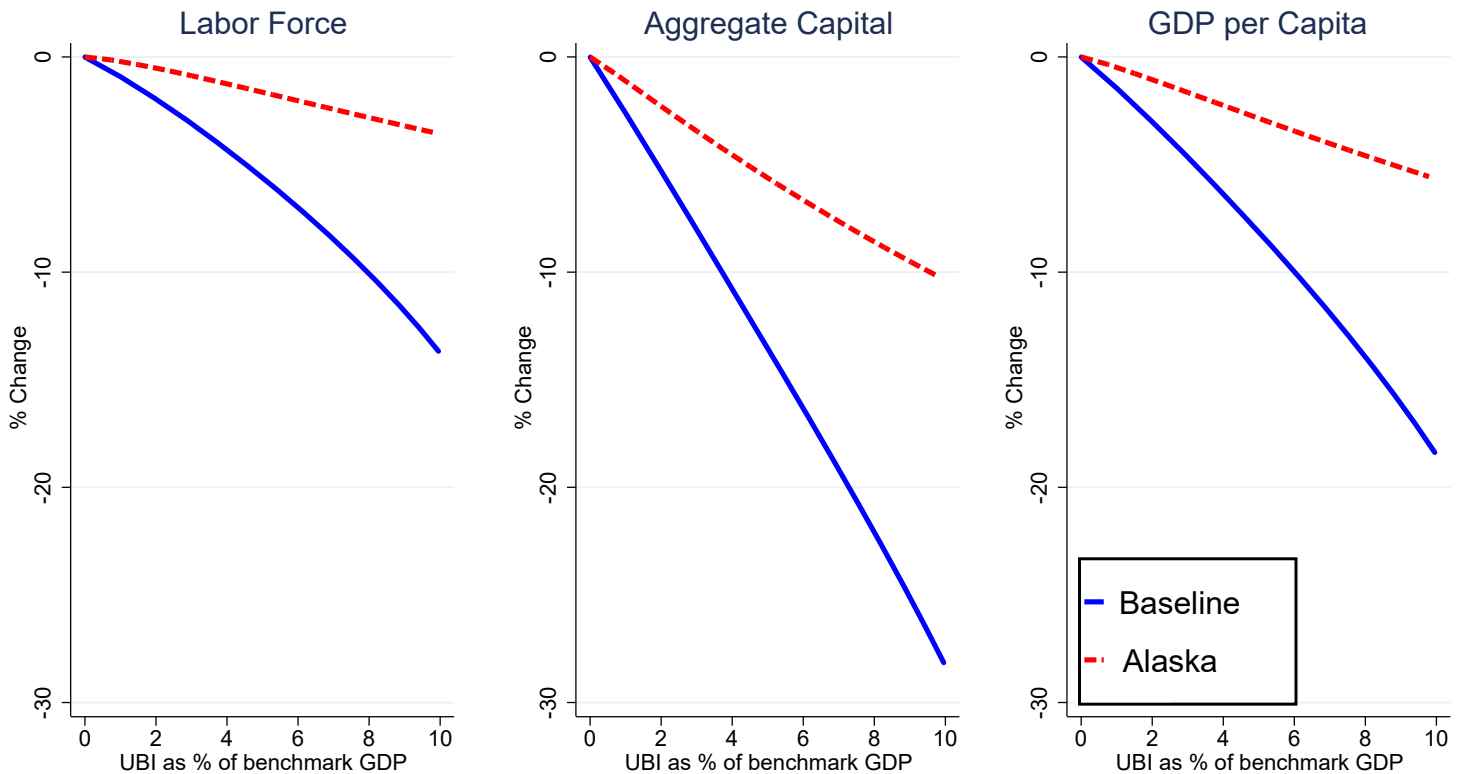
   Less demand for insurance reduces aggregate capital (insurance)

3. **Positive income effect**:

   More people stay outside of the labor force (income)

Cost breakdown: importance of the substitution channel

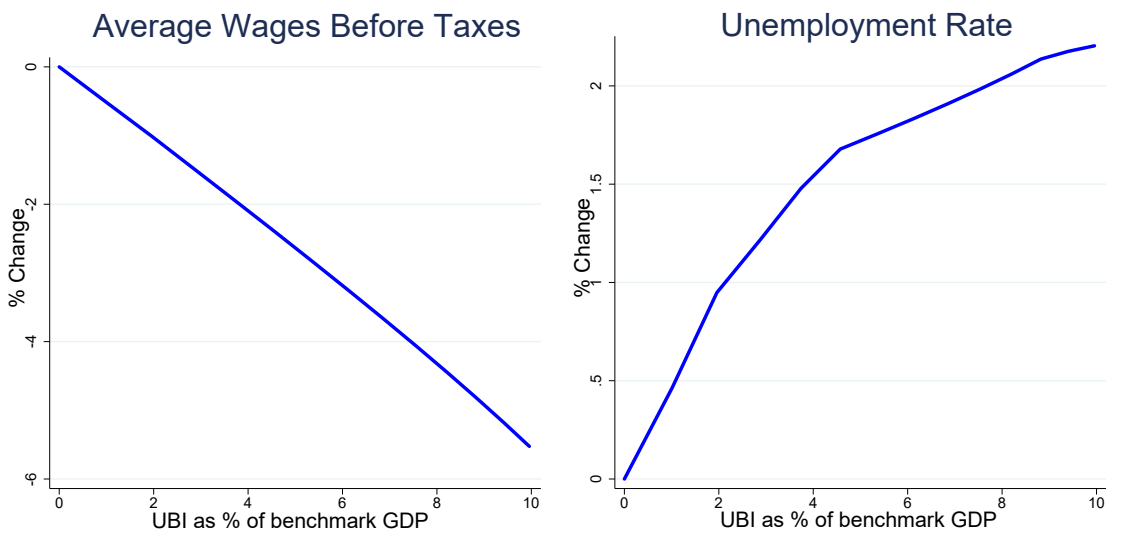
- How important is the substitution (high taxes) effect?
- Back to the Alaska experiment - holding taxes constant



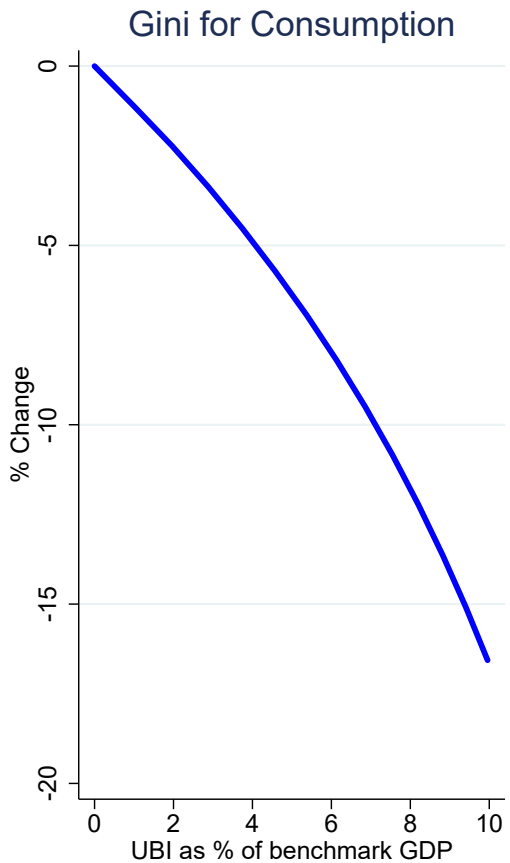
- Taxes explain $\sim 2/3$ of the impact
- Cost breakdown: insurance and income effects

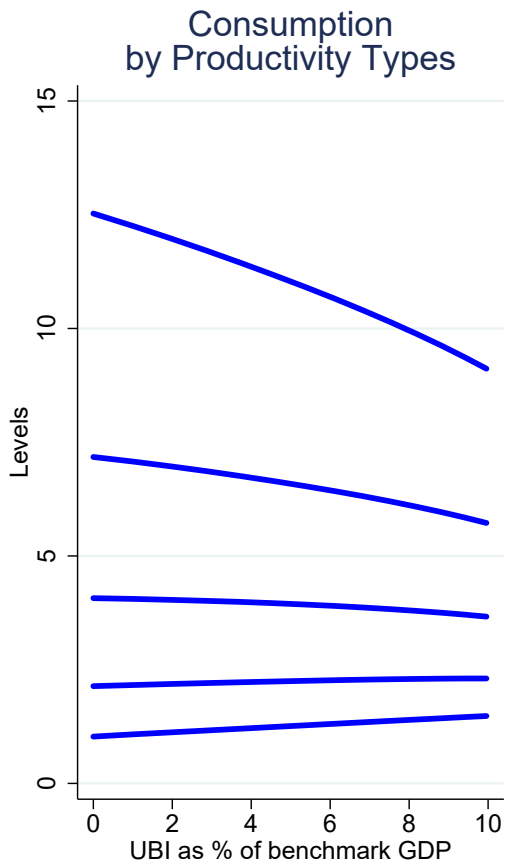
Capital vs Labor force decline: causes and implications

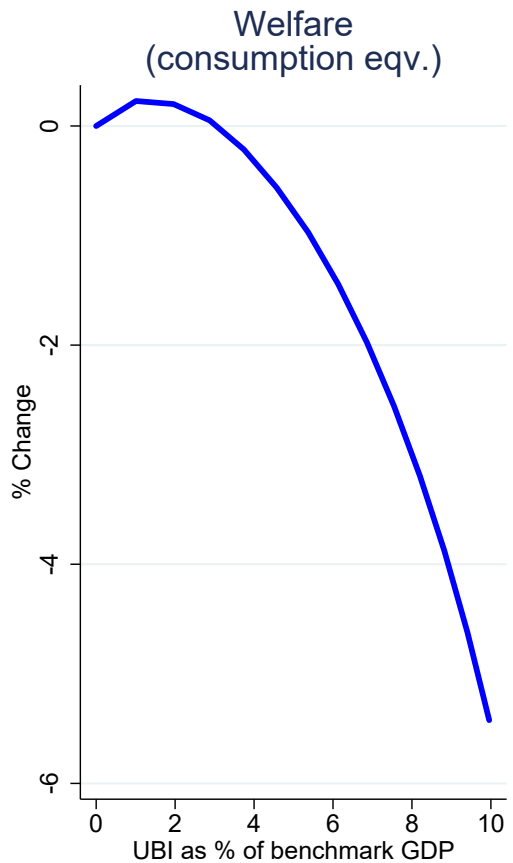
- Substitution (taxes) and income channels decrease labor force participation
- Through capital-labor complementarity reduces *aggregate* capital
  - But not *per worker* capital
- In contrast, insurance effect lowers capital per worker & productivity
  - Leading to lower wages and (slightly) higher unemployment



Welfare







welfare calculation

Results II: Alternative funding:

Changing Progressive Taxation

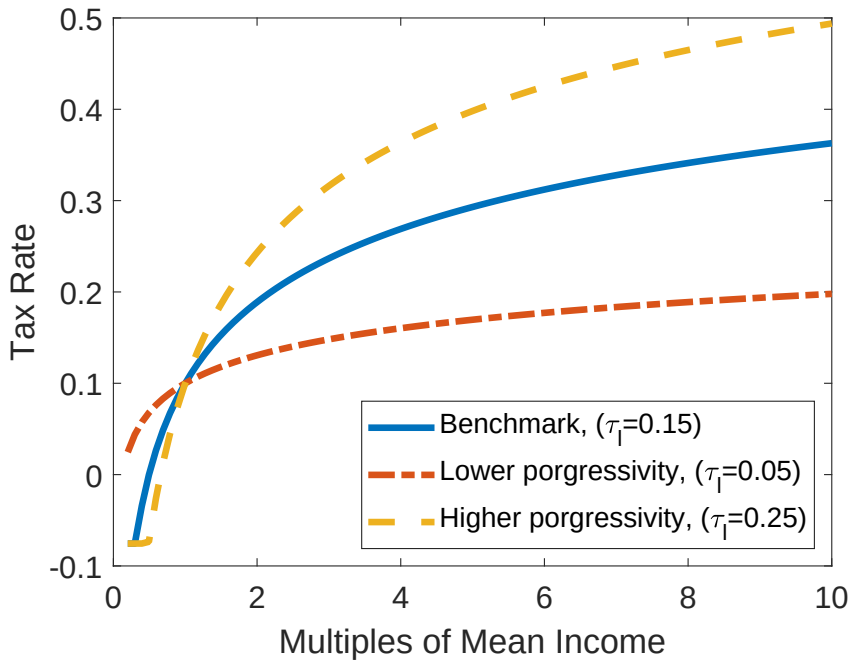
Does the financing scheme matter?

- Distortionary taxation accounts for most of output's decline
- Repeat the previous exercise for different tax progressivity schemes:
  - Increase (more progressivity) or decrease (less progressivity) τ_l:

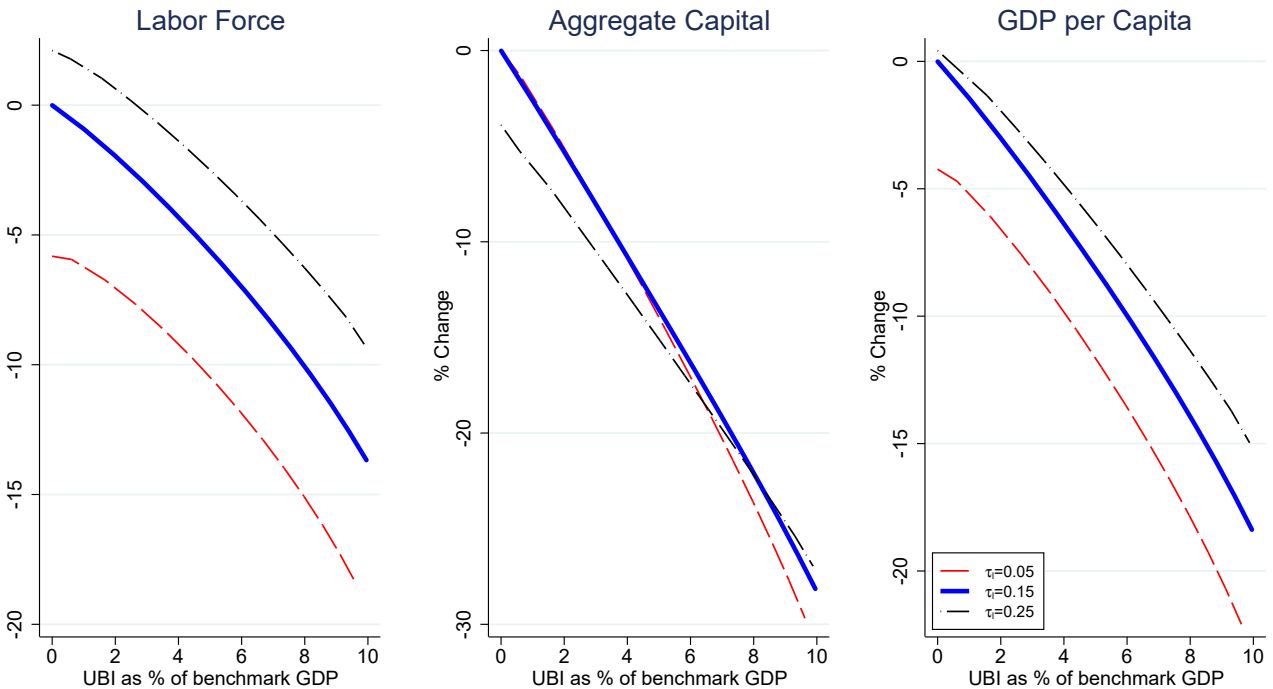
$$t_l(y_l) = 1 - \lambda_l \left(\frac{y_l}{\bar{y}_l} \right)^{-\tau_l}$$

- Two channels to keep in mind when progressivity increases:
  - A stronger incentive to participate in the labor force
  - Lower need for insurance, further lowering the demand for capital

Progressivity levels at work

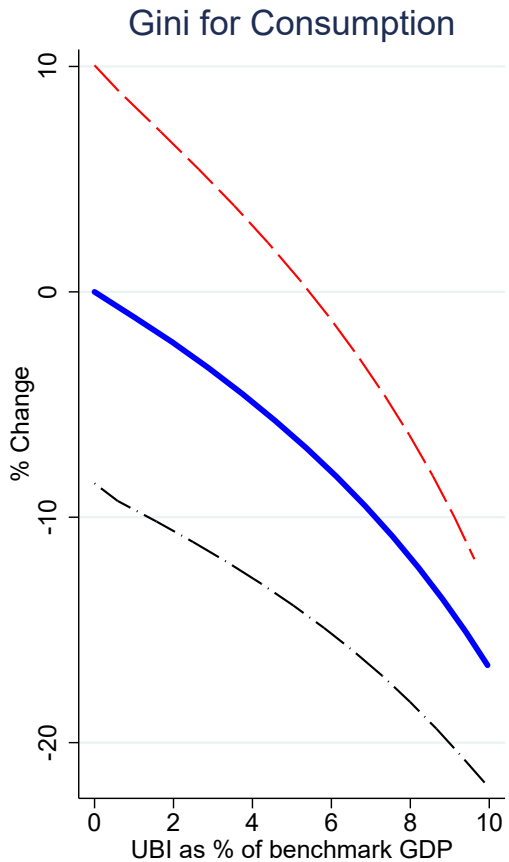


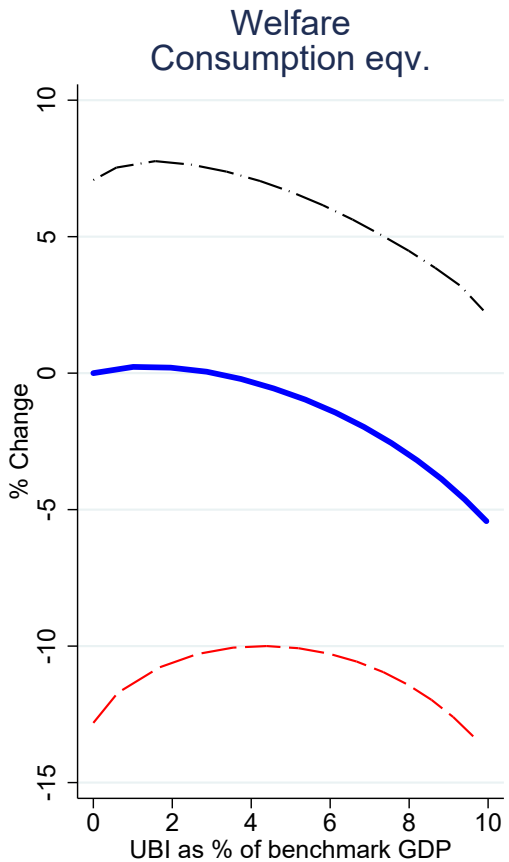
Higher progressivity mitigates the UBI effect

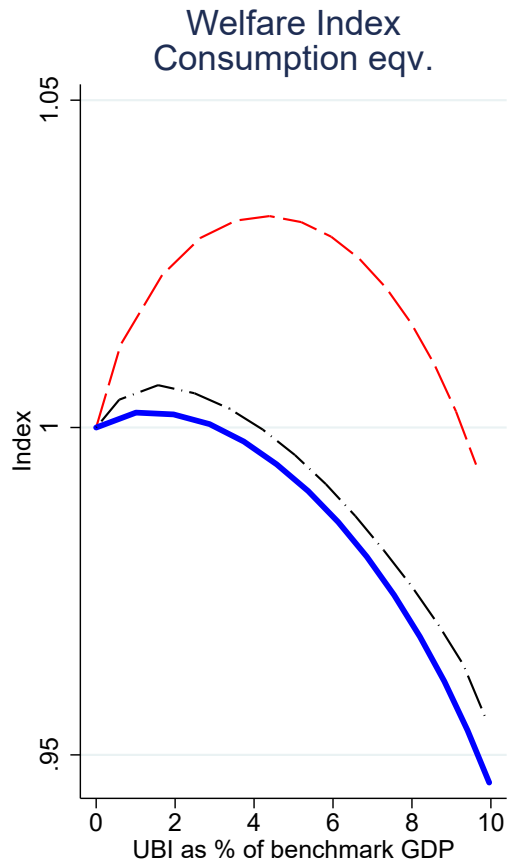


- Most of the effect is through labor force
- Aggregate capital is effected by labor force vs. insurance
- High progressivity could have larger impact through EITC

Progressivity matters for Welfare







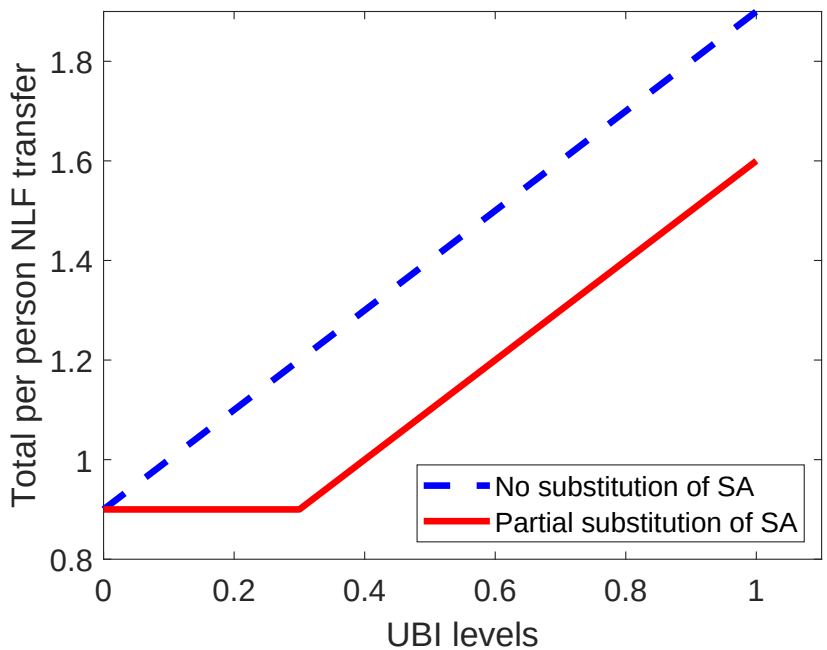
- UBI can only be justified as an alternative to progressive taxation

Results III: Alternative design:

Phasing out some social assistance programs

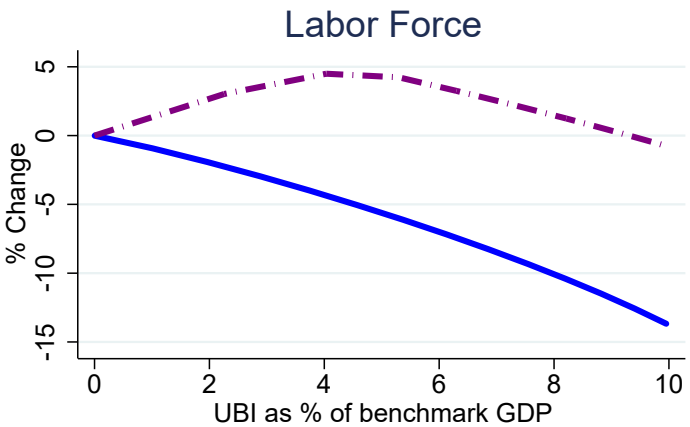
Substituting other Programs by UBI

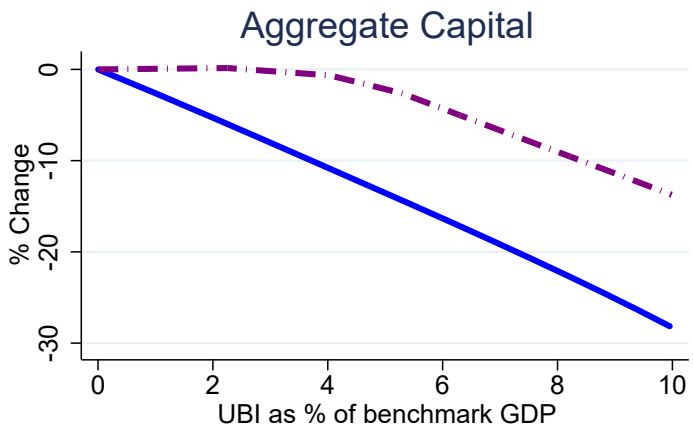
- UBI substitute only "welfare oriented" programs (about a 1/3 of b^{NLF})
- In practice:
  - People outside the labor force always get at least b^{NLF}.
  - Receive no UBI as long as $UBI \leqslant \frac{1}{3} b^{NLF}$.
  - From that point onward the transfer increases 1-1 with UBI.

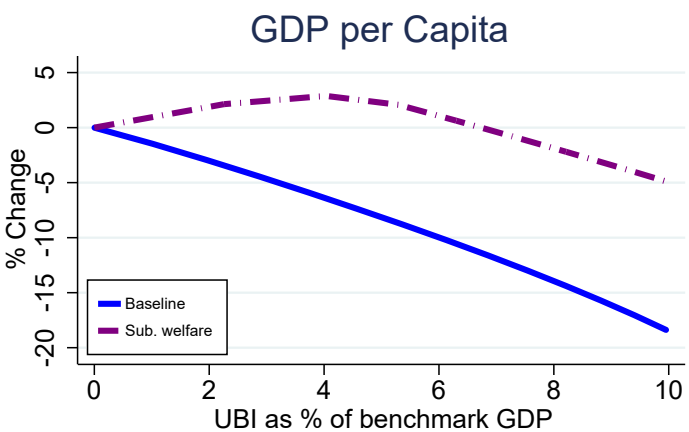


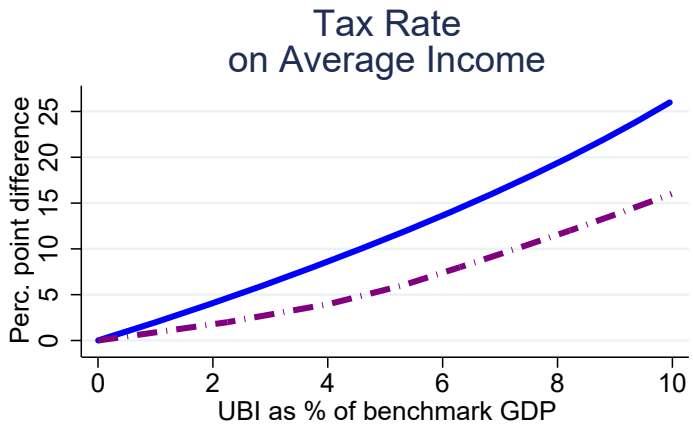
Algebraic expression

UBI INCREASES LABOR FORCE PARTICIPATION





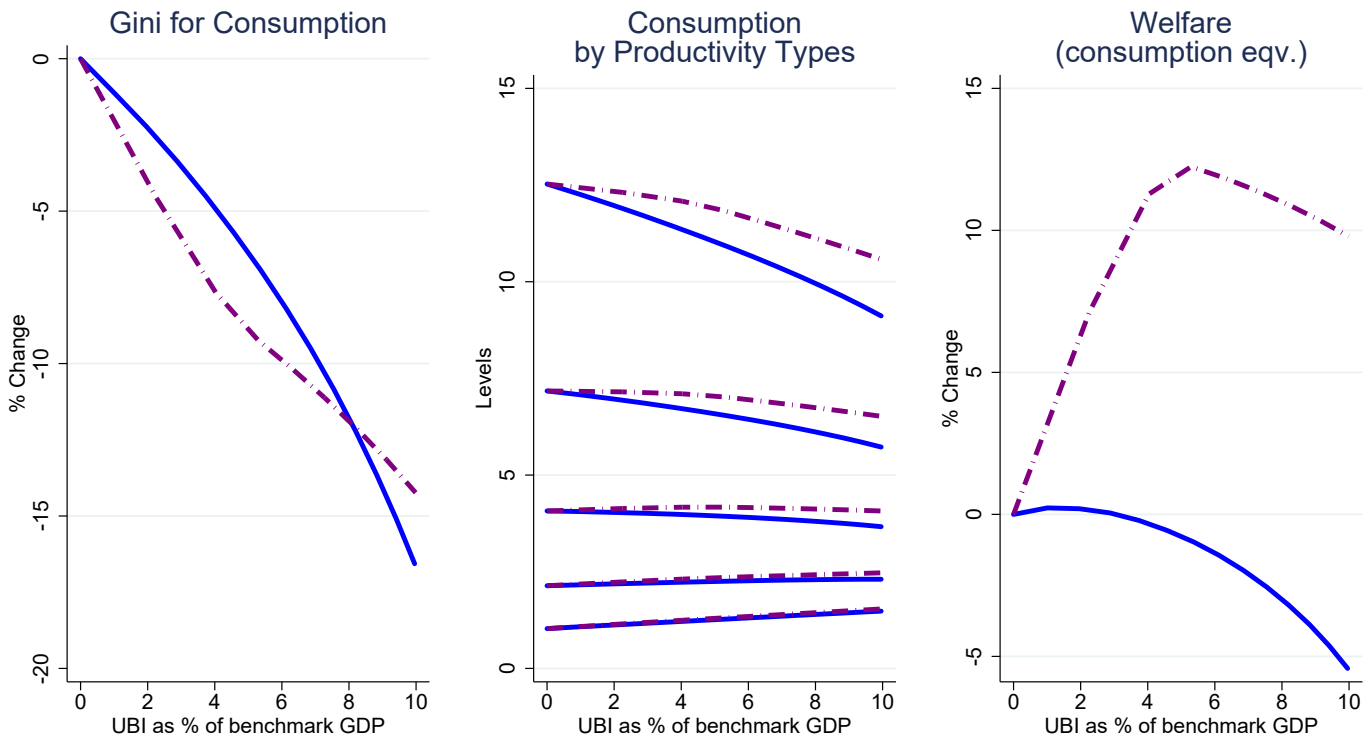




Moderate levels of UBI can increase welfare

- For moderate levels of UBI:

  Increased Resources + Increased Insurance = Higher Welfare



Welfare implications with transition dynamics

- We calculate the full transition dynamics for a specific case where UBI provides the highest steady-state welfare:
  - 5.3% of baseline GDP per capita.
  - Roughly $340 monthly.
- Welfare with transition dynamics still large, but somewhat smaller compared to the steady-state calculation:
  - While labor force increases immediately, average worker productivity is pulled down due to entrance at low-productivity levels.
  - Capital per worker declines immediately due to the insurance effect.

Transition dynamics

Conclusions

- We put together a rich model to study key channels of UBI
- Keeping progressivity and social assistance fixed, UBI sharply decreases labor force participation, capital and output, through:
  1. A substitution effect (high taxes)
  2. An insurance effect (lower demand for assets)
  3. An income effect (prefer staying outside the labor force)
- Changing Progressive Taxation can only justify UBI as a substitute for redistribution
- Partially substituting welfare with UBI increases participation and can justify a modest level of UBI

Backup

STATIONARY EQUILIBRIUM I

A stationary equilibrium consists of:

1. A set of value functions $\{W(a,p),\ U(a,p),\ J(a,p),\ V^{NLF},\ V\}$
2. Consumption $c^e(a,p)$ and $c^u(a,p)$ for employed and unemployed workers, respectively, as well as asset accumulation policy functions $g^e(a,p)$ and $g^u(a,p)$
3. A disutility cutoff $\Gamma*$
4. Prices $\{r, w(a,p), \pi\}$
5. Vacancy level v and demand for capital per worker $k(p)$
6. Tightness ratio θ and implied probabilities λ^w and λ^f
7. A government policy consists of: tax on labor income $t_l(y_l)$ and a flat tax on financial income t_a; transfers b^{NLF} for individuals out of the labor force; lump sum transfers UBI; A government expenditure G; a UI policy of replacement rate h and a ceiling on benefits κ
8. Dividends d

Stationary equilibrium II

9. Distributions over employment status (either e or u), assets a and individual productivity p, denoted by $\mu^e(a,p)$ and $\mu^u(a,p)$, as well as a measure of individuals outside the labor market μ^{NLF}

Stationary equilibrium III

such that:

1. Given the job finding probability λ^w, the wage function, and prices $\{r, \pi\}$, the worker's choices of c and a' solve the optimization problem for each individual. This results in the value functions $W(a, p)$, and $U(a, p)$.
2. Given the value of staying outside of the labor force, and the value of entering the labor force U(0,$\underline{p}$), Γ^* is the threshold utility cost of joining the labor force.
3. Given the wage functions, prices, the distribution $\mu^e(a, p)$, and the workers asset accumulation decisions, each firm solves the optimal choice of $k(p)$. This results in $J(a, p)$.
4. Given the wage functions, prices, the distribution $\mu^u(a, p)$, the unemployed workers asset accumulation decisions, and the job filling probability λ^f, firms compute the value V. With free entry, $V = 0$.
5. The asset market clears, and the aggregate demand for capital equals supply.
6. The wage functions $w(a, p)$ are determined by Nash bargaining.

STATIONARY EQUILIBRIUM IV

7. The government has a balanced budget.

$$\sum_a \sum_p \left[\mu^e(a,p)\left(w(a,p)t_l\left(w(a,p)\right)+at_a(1-q)\right)+\mu^u(a,p)\left(b(p)t_l\left(b(p)\right)+at_a(1-q)\right)\right]$$
$$=\sum_a \sum_p \left[\mu^u(a,p)b(p)\right]+G+\mu^{NLF}\left[b^{NLF}+max(UBI-\overline{UBI},0)\right]+(1-\mu^{NLF})UBI \quad (1)$$

8. The dividend paid to equity owners every period is the sum of flow profits from all matches, net of the expenditure on vacancies.[1]

$$d=\sum_a \sum_p \left[\left(pf(k(p))-rk(p)-w(a,p)\right)\mu^e(a,p)\right]-\xi v \quad (2)$$

STATIONARY EQUILIBRIUM V

9. The distributions $\mu^e(a,p)$ and $\mu^u(a,p)$ are invariant and generated by $\{\lambda^w, s, \phi\}$, the law of motion for individual productivity and the asset accumulation policy functions as follows:

$$\begin{aligned}
\mu^e(a',p') &= (1-\phi)\{(1-s)\sum_a\sum_p \mu^e(a,p)\times Pr(p'|p)\times 1\{g^e(a,p)=a'\} \\
&\quad +\lambda^w\sum_a\sum_p \mu^u(a,p)\times Pr(p'|p)\times 1\{g^u(a,p)=a'\}\} \\
\mu^u(a',p') &= (1-\phi)\{s\sum_a \mu^e(a,p')\times 1\{g^e(a,p')=a'\} \\
&\quad +(1-\lambda^w)\sum_a \mu^u(a,p')\times 1\{g^u(a,p')=a'\}\}+\phi\times Pr(p)\times 1\{a'=0\}
\end{aligned}$$

$$1 = \sum_a\sum_p (\mu^e(a,p)+\mu^u(a,p))+\mu^{NLF}$$

Back

Welfare calculation

- We focus on steady state comparisons.
- For each policy:
  1. Compute the value from consumption in the steady state.
  2. Compute the stock of disutility due to the participation cost.
  3. Add (1) and (2).
  4. Derive the equivalent consumption.
- Compare the consumption equivalent measures across steady states.

back

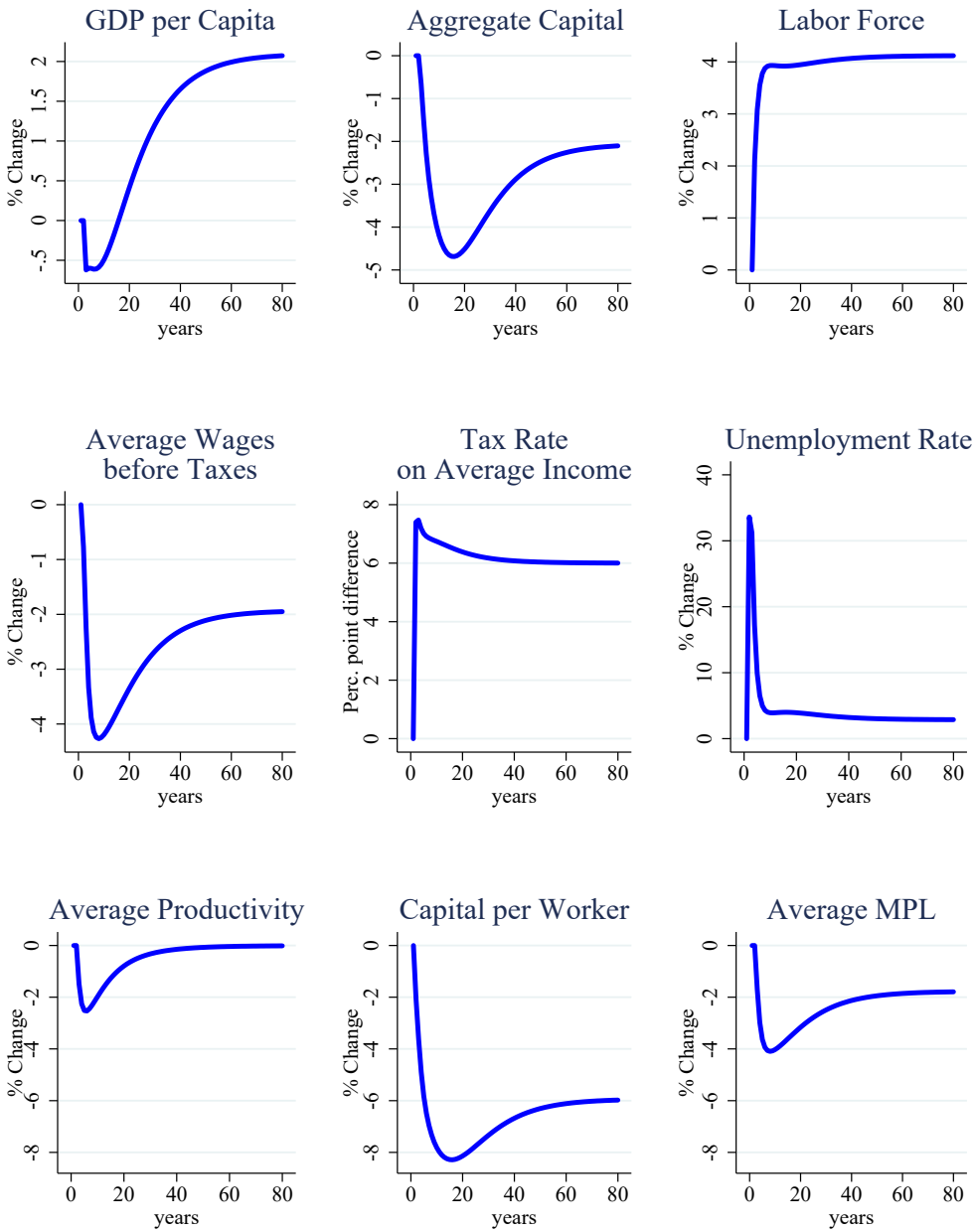
UBI DEFINITION

"...three features to define a UBI:

1. *It provides a sufficiently generous cash benefit to live on, without other earnings.*
2. *It does not phase out or phases out only slowly as earnings rise.*
3. *It is available to a large proportion of the population, rather than being targeted to a particular subset (e.g., single mothers)."*

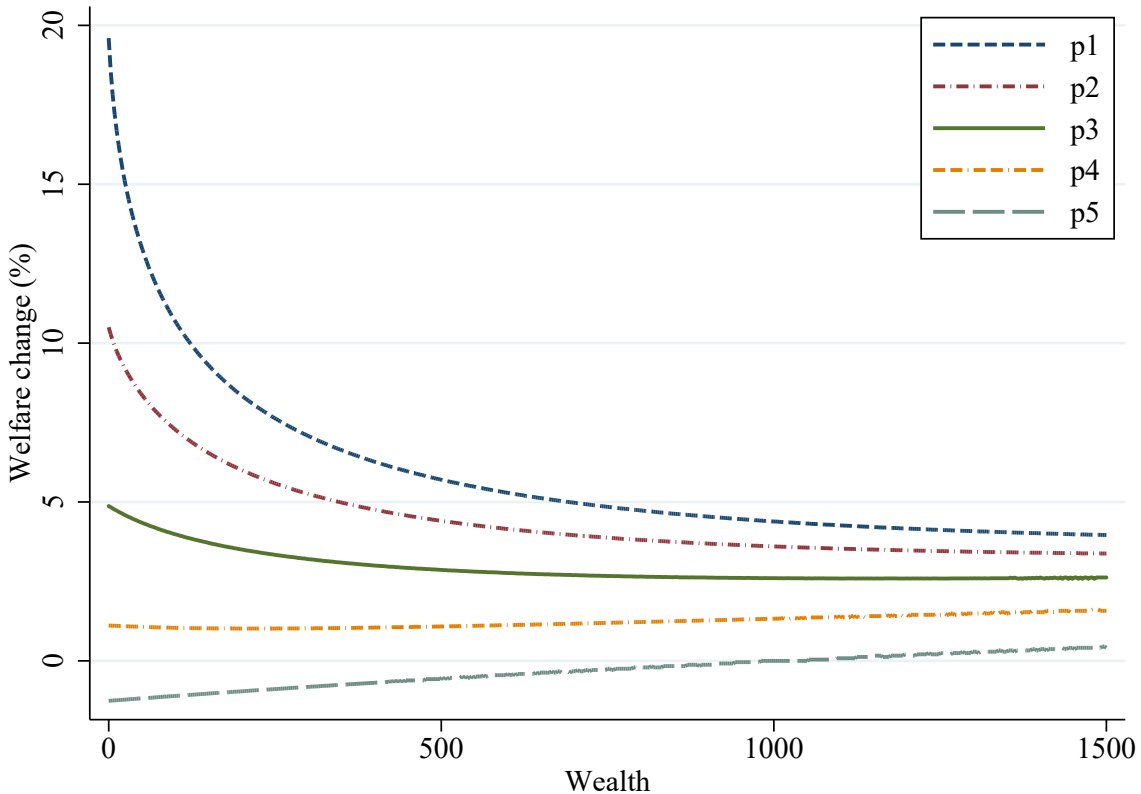
(Hoynes and Rothstein, ARE, 2019, pp. 930)

TRANSITION DYNAMICS



back

TRANSITION DYNAMICS - WINNERS AND LOSERS



back

Substituting other Programs by UBI

- UBI substitute only "welfare oriented" programs (about a 1/3 of b^{NLF})
- In practice:
  - People outside the labor force always get at least b^{NLF}
  - Receive no UBI as long as $UBI \leqslant \frac{1}{3} b^{NLF}$.
  - From that point onward the transfer increases 1-1 with UBI
- Formally:

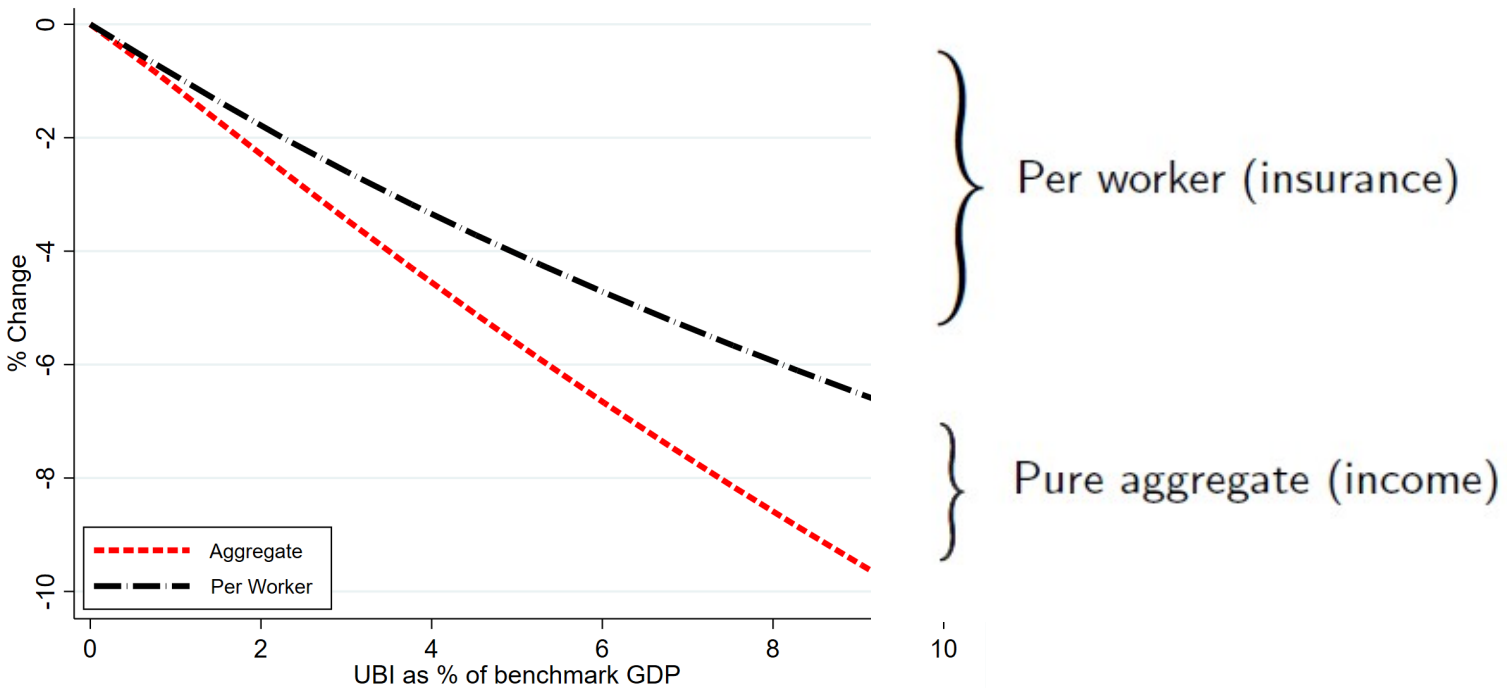
$$c_{NLF} = y_{NLF} = \begin{cases} b^{NLF} & \text{if } UBI < \overline{UBI} \\ b^{NLF} + UBI - \overline{UBI} & \text{if } UBI > \overline{UBI} \end{cases}$$

Back to Substituting other Programs by UBI

Cost breakdown: insurance and income effects

... Still the Alaska experiment - holding taxes constant

- Income effect only affects total capital (CRS production)
- Remaining (per worker) effect is due to lower demand for savings



- Within Alaska experiment insurance effect accounts for 2/3 of capital drop

Back