The Interplay between Wealth and Human Capital Inequality - Implications for the UK's post-COVID19 recovery

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Wealth and Human Capital

Introduction:

- Wealth and human capital are intricately linked.
- Wealth enables investment in education and skills, boosting future earning potential.

Mechanisms of Relationship:

- **Investment in Skills:** Wealth allows for investment in education and training, directly boosting human capital. This forms a virtuous cycle, as higher human capital can lead to higher future wealth.
- **Safety Net:** Wealth acts as a buffer against economic shocks, helping individuals maintain or even increase their human capital investments during tough times. This reduces the long-term impact of economic downturns on individual human capital.
- **Risk-Taking:** Wealth enables individuals to undertake long-term, higher-risk projects that may not offer immediate returns but have high future payoffs. This can lead to innovative or unconventional pathways for human capital accumulation.

Relevance of the Topic

Introduction:

- The interplay between wealth and human capital is crucial for understanding societal issues like inequality and economic resilience.

Key Issues:

- **Wealth Disparities:** Unequal opportunities for education and training can exacerbate wealth and income gaps. This has long-term implications for social mobility and economic inequality.
- **Wealth Poverty Traps:** Low-wealth individuals face barriers to skill development, making it hard to catch up with wealthier peers. This creates a self-perpetuating cycle that's difficult to break without intervention.
- **Economic Shocks:** Events like COVID-19 disrupt human capital accumulation, with long-term consequences. Understanding these effects is key for effective policy intervention and recovery.

A Model of Human Capital and Wealth Inequality

Framework:

- Builds on the heterogeneous agent incomplete market model. Aims to offer a more nuanced view of wealth inequality.

Model Features:

- Incorporates endogenous elements like wealth and human capital into a general equilibrium framework. Seeks to shed some light on their interactions.

Wealth and Income:

- Explores the interplay between wealth, human capital and income. An extension from models with exogenously given labor earnings.

Aim of the Paper

Primary Objectives:

- **Stationary Equilibrium:** Analyse the interaction between wealth and human capital in a stationary state. This allows us to understand how wealth and human capital co-evolve over time.
- **Economic Dynamics:** Examine the distribution of human capital following an unexpected economic shock. Provides insights into resilience and recovery mechanisms.
- **COVID-19 Impact:** Assess the economic consequences of the COVID-19 pandemic and policy responses in the UK. Aims to inform future policy decisions.

The Model

Household Behavior:

- Households are ex-ante homogeneous and allocate income between consumption, riskless investment, and human capital improvement. This sets up the basic economic decisions households make.

Labour Productivity:

- Wages are based on labour productivity, which faces idiosyncratic shocks, making human capital a "risky" asset. This introduces an endogenous distribution of wealth and human capital.

Household Dynasties:

- Households are infinitely lived dynasties, where members "die" stochastically. Offspring inherit savings but only a fraction of human capital. This adds a generational aspect to wealth and human capital accumulation.

Household decisions: Households are modelled as infinitely lived dynasties, that maximize their utility subject to various constraints. Households can consume, save or invest in their human capital.

Utility Maximization: $E_0 \sum_{t=0}^{\infty} \beta^t u(c_t)$

Households maximize the sum of their discounted utilities over time. The discount factor β accounts for time preference and probability of dying.

Budget Constraint: $c_t + a_{t+1} + x_t = (1 + r_t)a_t + y_t, a_{t+1} > a_{min}$

The budget constraint outlines how consumption, savings, and human capital investments are financed by assets and income. Borrowing is subject to a constraint.

Human Capital: $h_{t+1} = \delta h_t + \chi x_t^{\upsilon}$

Human capital is accumulated through investment and depreciates over time.

Household income: Households earn labour income by supplying their human capital on a competitive labour market. Return to human capital is risky, since it depends on an exogenous efficiency term.

Labour Productivity: $l_t = e_t * \log(1 + h_t)$

Labour productivity is influenced by individual efficiency and human capital.

Productivity Process: $\log(e_t) = \phi_t \log(e_{t-1}) + \varepsilon_t$

Efficiency follows an autoregressive process, capturing persistence and random shocks.

Taxes & Transfers: $y_t = \tau_1 \left(l_t w_t\right)^{1-\tau_2}$

The model considers a simplified tax and transfer system affecting individual income.

Simplified Life-cycle Setup:

The model incorporates a simplified life-cycle framework to capture the dynamics of ageing and retirement.

Retirement and Replacement:

Workers retire or die **stochastically** and are replaced by a new worker from the same household.

The expected working life is set at 30 years for simplicity.

Inheritance of Assets and Skills:

The new worker inherits the assets, and portions of the human capital and efficiency from their parent.

This mechanism captures intergenerational transfers of wealth and skills within the household.

Aggregate Production: A representative firm employs aggregate capital and labour services to produce a final good according to a Cobb-Douglas production function.

Production Function: $Y_t = K_t^{\alpha} L_t^{1-\alpha}$

Aggregate output Y_t is produced using aggregate capital K_t and aggregate labor L_t. The parameter α indicates the output elasticity of capital.

Role of Government:

The government currently has a limited role, focusing primarily on income redistribution through the tax function. While the model incorporates a simplified tax and transfer system, it does not yet address other potential roles of the government, such as public goods provision. This is a key area for future model improvement.

Stationary Economy

Model Estimation:

- Model parameters are fitted to key features of the UK economy pre-COVID-19.
  For more details: Estimation Parameters Summary Statistics

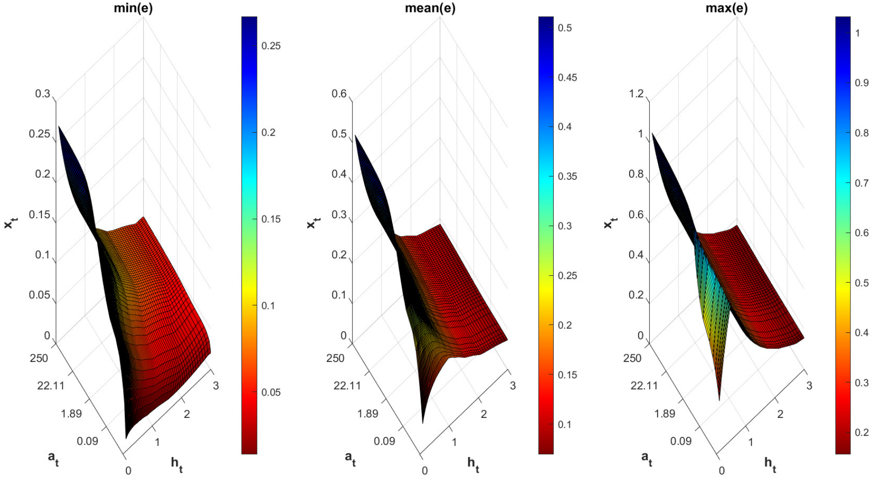
Role of Wealth:

- Wealth appears to be a pivotal factor in accumulating human capital, with implications for future earnings. This suggests that addressing wealth inequality could have broader economic benefits.

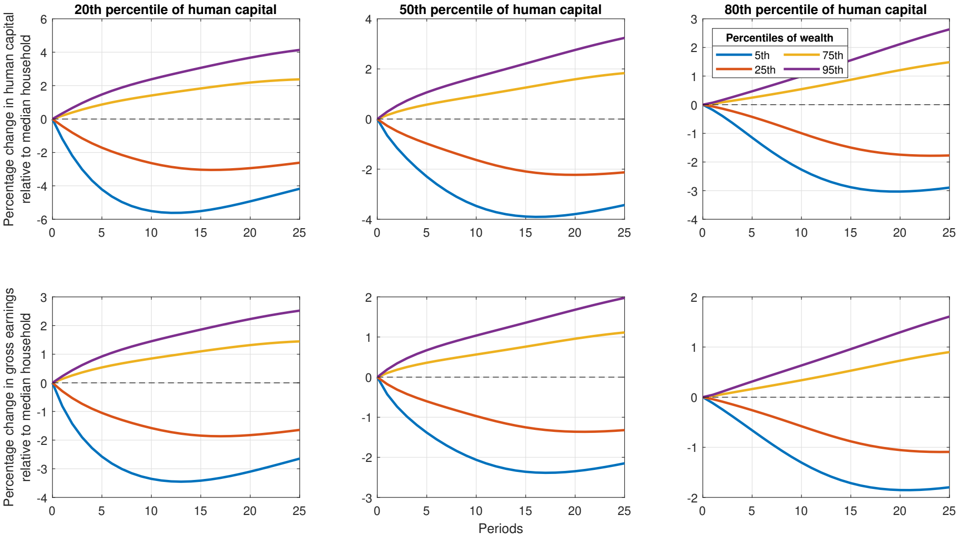
Nonlinearity in Policies:

- Nonlinearity in policy functions seems important for understanding the interplay between wealth and human capital.

Policy Functions



The role of initial conditions



Wealth, Human Capital and Opportunity

Trade-offs between Physical Assets and Human Capital:

- Individuals must decide between investing in financial assets for immediate returns or in human capital for long-term benefits. The model captures these trade-offs explicitly.

Wealth Enables Faster Human Capital Accumulation:

- Having more initial wealth allows for larger investments in education and skill development. Wealth acts as a facilitator for human capital accumulation.

Persistent Impacts of Initial Wealth:

- Even small differences in initial wealth can lead to substantial disparities in human capital and earnings over the long term. Initial conditions have a lasting impact.

From Stationary Equilibrium to Dynamic Shocks

Previously:

- Explored policy functions in a stationary equilibrium. Found that wealth and human capital inequalities are interlinked and can be perpetuated through generations.

Reality Check:

- Acknowledged that real-world economies face unexpected shocks. Examples: Financial Crisis, Brexit, Covid-19, and the Ukraine crisis.

Up Next:

- Analyzing the model's response to an unexpected aggregate productivity shock ("MIT" shocks). This will set the stage for evaluating the impact of the Covid-19 pandemic.

Methodology:

- Introduce a one-off 1% TFP shock that applies uniformly across the distribution. This simulates an instantaneous and widespread impact on productivity.

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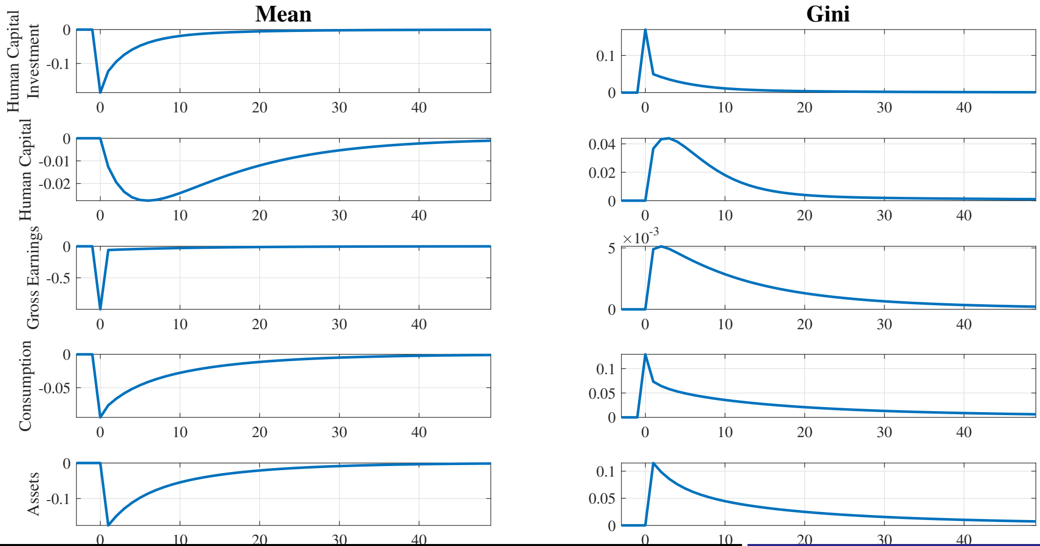
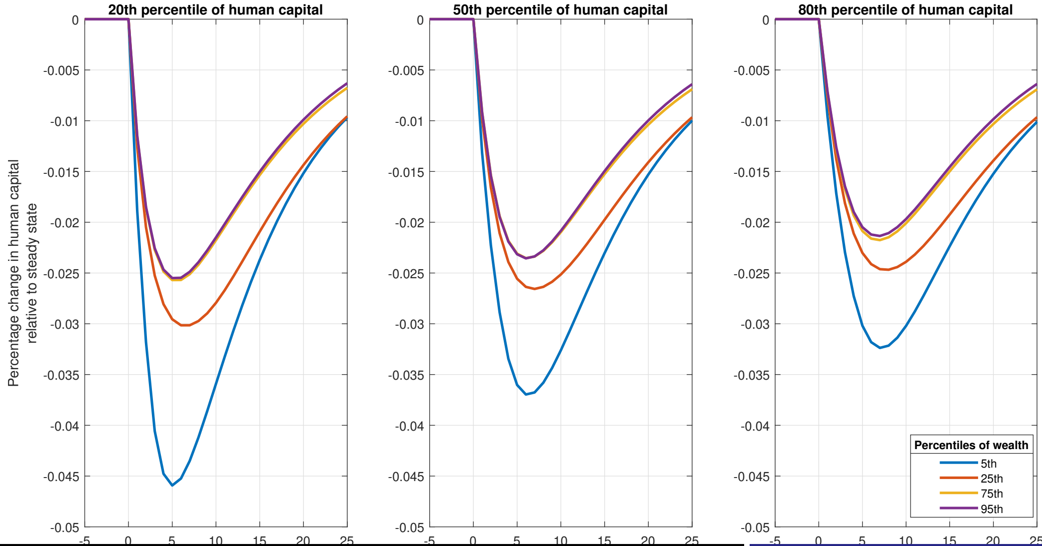
Aggregate Effects



Across the distribution



Impact of MIT Shock

Key Findings:

- Even small shocks have medium-to-long-term effects on aggregate variables. Shock is inequality increasing in the medium and long run.

Distributional Consequences:

- Leads to persistent increases in human capital and earnings inequality. This affects current and future consumption and welfare.

Implications:

- Initial distribution of wealth and human capital significantly affects aggregate response. More borrowing-constrained households imply a slower recovery.

Note on Real-world Shocks:

- Economic shocks often disproportionately impact struggling workers. Exacerbates the need for targeted policy responses.

Applying the Model to the Covid-19 Crisis: Overview

- Covid-19 as a defining economic crisis, requiring unprecedented policy interventions.
- Long-term impacts on human capital and wealth inequality are not yet fully understood.

Unique Contributions:

- Model distinguishes between level and productivity of human capital.
- Accounts for the role of wealth inequality in propagating the Covid-19 shock.

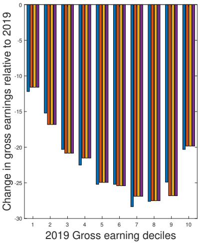
Key Findings:

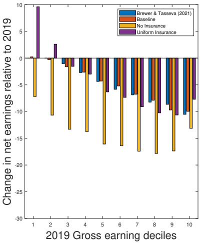
- Policy interventions provided crucial insurance, but may have unintended consequences.
- Potential for increased long-term inequality in wealth, human capital, and income.

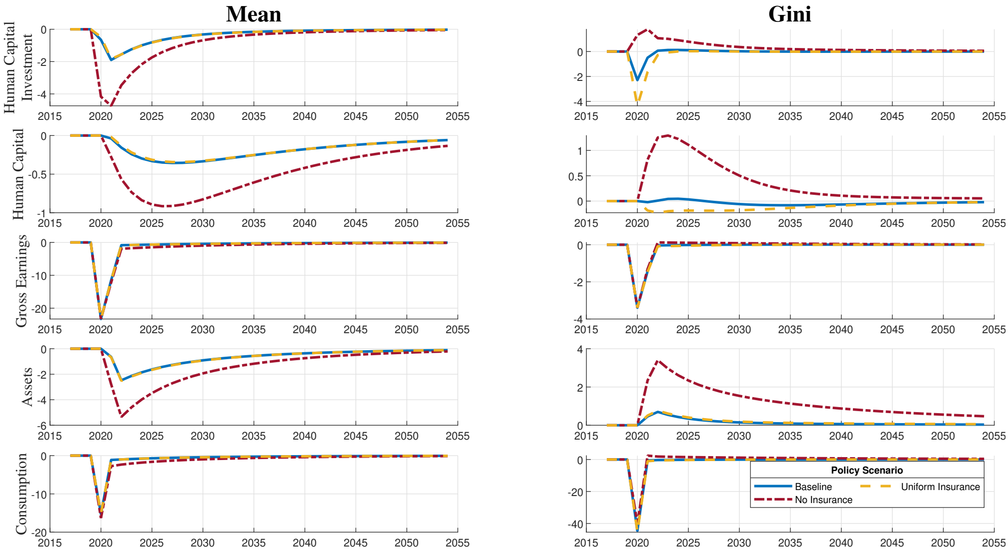
Applying the Model to the Covid-19 Crisis: Methodology

Methodology:

- Simulate response to an unexpected, non-uniform productivity shock.
- Assess under different policy interventions. Baseline insurance, no additional insurance and uniform insurance. Policy intervention includes a limit on consumer spending. Savings response.
- Examine both immediate and long-term effects.






Mean
Gini
Human Capital Investment
Human Capital
Gross Earnings
Assets
Consumption
2015 2020 2025 2030 2035 2040 2045 2050 2055
Policy Scenario
Baseline
Uniform Insurance
No Insurance

Aggregate Effects of the Crisis

Impact on Human Capital Investment:

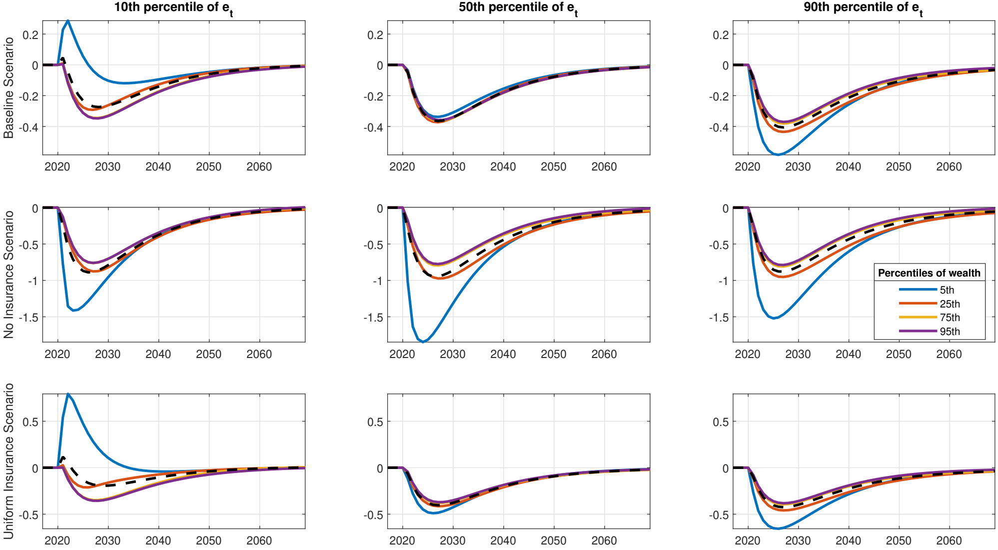
- Crisis significantly reduces human capital investment.
- Even with strong policy intervention, the decline is unavoidable. This points to the limitations of policy in counteracting such a large-scale shock.

Long-Term Persistence of Shock:

- Effects take a long time to dissipate.
- Human capital doesn't return to baseline levels for a generation. This underscores the long-lasting nature of the crisis's impact.

Role of Policy Intervention:

- Absence of intervention would have led to even worse outcomes.
- Amplification of inequality would be more severe. Stresses the critical role of timely and effective policy intervention.


10th percentile of e_t
50th percentile of e_t
90th percentile of e_t
Baseline Scenario
No Insurance Scenario
Uniform Insurance Scenario
Percentiles of wealth
5th
25th
75th
95th
2020
2030
2040
2050
2060

Covid-19 and Preexisting Inequalities

Two Main Channels:

- Unequal distribution of productivity shock.
- Differential capacity of households to cope based on initial wealth and human capital.

Key Insights:

- Short-term: Progressive impact on human capital distribution. Lower skill households reduce human capital less.
- Short-term: Policy intervention was particularly relevant for low-wealth households. Those with lower ability to self-insure against the pandemic. Asset response.
- Medium-term: Need to ensure recovery is sustained. Draw-down of assets has left poorer households vulnerable.

Measuring Welfare Losses in the Covid-19 Pandemic

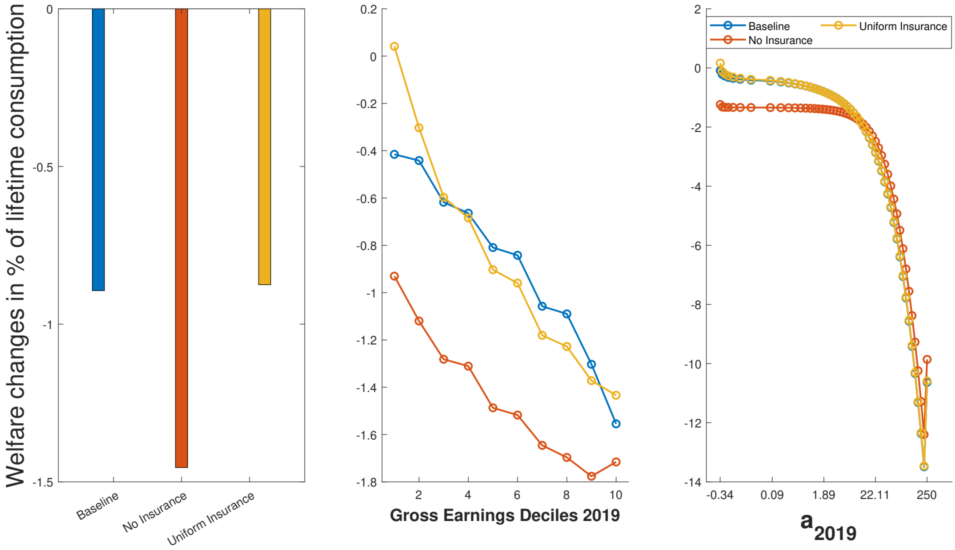
Approach:

- Using value functions to evaluate welfare losses.
- Converted into *lifetime equivalent consumption*.

Key Findings:

- Average household would trade 0.9% lower consumption to avoid the pandemic.
- Policy intervention preferable to no insurance.
- Welfare losses not uniformly distributed. Losses increasing in income and wealth, due to government insurance and consumption restrictions.

Welfare without cap


Welfare changes in % of lifetime consumption
0
-0.5
-1
-1.5
Baseline
No Insurance
Uniform Insurance
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
2
4
6
8
10
Gross Earnings Deciles 2019
2
0
-2
-4
-6
-8
-10
-12
-14
Baseline
Uniform Insurance
No Insurance
-0.34
0.09
1.89
22.11
250
a2019

Policy Implications and Future Challenges

The cost of intervention

- Additional support measures protected vulnerable parts of society. Likely avoided very deep and long-lasting economic recession.
- However, many households have been left with insufficient resources to counteract future shocks. Low savings means these households are vulnerable to aggregate shocks.
- How do we deal with future/ongoing crisis in the medium run?

Debt Repayment:

- Necessitates future taxation to regain fiscal space. Requires balance to not disincentivize saving or human capital accumulation.

Conclusion and Future Directions

Key Findings:

- Non-linearities in human capital investments, introduce a mechanism for wealth distribution to affect income. Wealth inequality matters, and a lot so at the lower end.
- Importance of wealth disparities in economic dynamics, both household level and aggregate. High share of low-wealth households can create a sluggish recovery after shocks.

Covid-19 Analysis:

- Significant fall in aggregate human capital. Likely long lasting recovery period ahead.
- Support measures were effective but at a large cost. Need to consider fiscal space necessary to intervene in future crises.

Future Research:

- Include broader levers for policy. Consider debt repayment; training policies; future shocks; etc.

Thank you for your attention!

Scan to access the paper

Calibration and Estimation

3-Step Calibration Procedure:

1. **Set Standard Values:**
   - Parameters: β, α, σ, ζ
   - These are set to commonly used values in the literature.

2. **Outside Calibration:**
   - Parameters: τ_1, τ_2, ω, A
   - Calibrated using data without solving the model.

3. **SMM Estimation:**
   - Parameters: ϕ^{stay}, ϕ^{exit}, η, δ^{stay}, δ^{exit}, χ, υ, $a_{\min}$
   - Estimated by choosing $\hat{\theta}$ to minimise:

$$\min_{\theta}[\hat{m}^{Data} - \hat{m}(\theta)]^T W[\hat{m}^{Data} - \hat{m}(\theta)] \tag{1}$$

W is a diagonal weighting matrix. $\hat{m}^{Data}$ are selected data moments and $\hat{m}(\theta)$ refer to corresponding model implied moments.

Take me back!

Calibrated Parameters

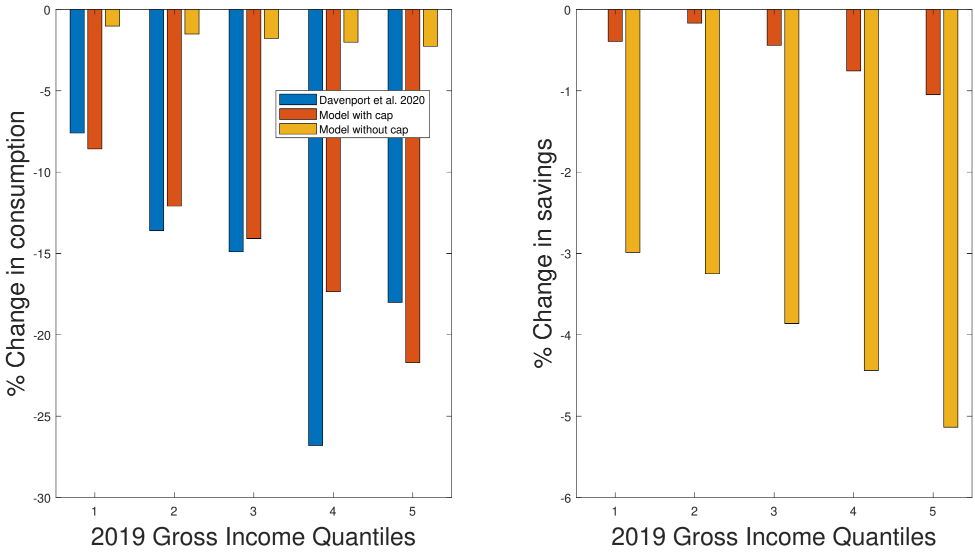
Parameter	Description	Value	Standard Error	Calibration Method
ϕ^{stay}	Persistence of Prod. Shock	0.783	(0.004)	Minimum Distance
ϕ^{exit}	Intergenerational transmission of Prod.	0.564	(0.017)	Minimum Distance
η	Variance of Prod. Shock	0.478	(0.004)	Minimum Distance
τ_1	Linear Taxes	0.943	-	Outside Calibration
τ_2	Progressivity of Taxes	0.388	-	Outside Calibration
δ^{stay}	Depreciation of HC	0.912	(0.002)	Minimum Distance
δ^{exit}	Intergenerational transmission of HC	0.374	(0.012)	Minimum Distance
χ	Linear HC Production	0.470	(0.008)	Minimum Distance
υ	Decreasing Returns in HC	0.618	(0.005)	Minimum Distance
β	Discount Factor	0.96	-	Standard Value
α	Labour Share	0.3	-	Standard Value
σ	CRRA Coefficient	1.5	-	Standard Value
ζ	Depreciation Rate of Capital	0.1	-	Standard Value
a_{min}	Borrowing Limit	-0.340	(0.011)	Minimum Distance
ω	Probability of Labor Force Exit	0.03333	-	Outside Calibration
A	Total Factor Productivity	1	-	Normalization

Take me back!

Endogenous Variables

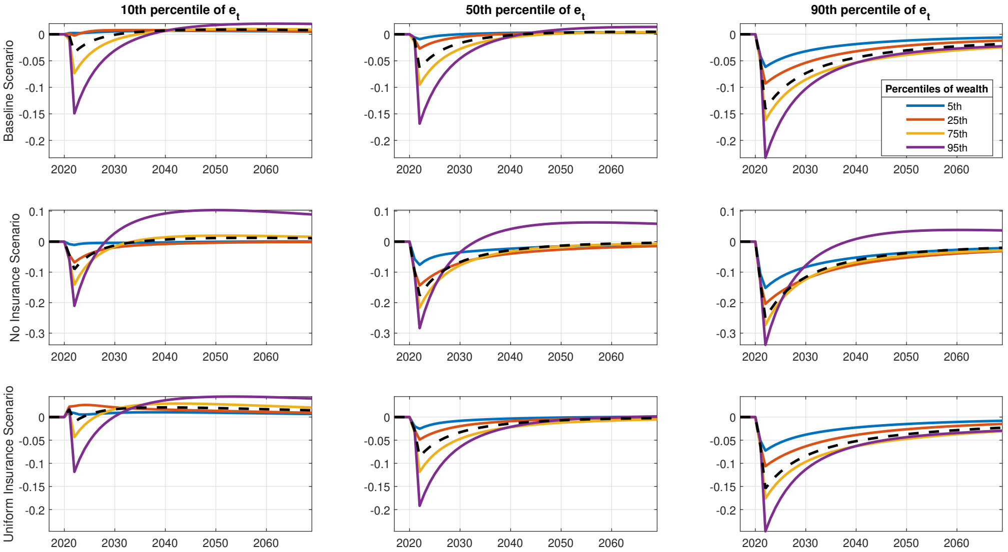
	Gross Earnings	Net Earnings	Gross Income	Net Income	Human Capital	Assets	Consumption	HC Investment	Net Transfers
Mean/Median	1.097	1.025	1.125	1.046	0.962	1.459	1.016	1.059	5.646
Gini	0.287	0.179	0.28	0.187	0.099	0.565	0.14	0.165	1.525
CoV	0.547	0.325	0.528	0.338	0.185	1.108	0.253	0.319	3.165
P10/P50	0.478	0.637	0.504	0.635	0.682	-0.07	0.709	0.734	-9.548
P90/P50	1.851	1.457	1.886	1.518	1.141	3.661	1.342	1.465	26.719
$Q_{<50}$	0.284	0.345	0.298	0.361	0.648	0.266	0.339	0.06	-0.008
$Q_{>80}$	0.352	0.281	0.358	0.295	0.443	1.208	0.23	0.046	0.017
$Q_{>90}$	0.22	0.166	0.211	0.165	0.248	0.828	0.124	0.026	0.013

Take me back!



% Change in consumption
Davenport et al. 2020
Model with cap
Model without cap
0
-5
-10
-15
-20
-25
-30
1
2
3
4
5
2019 Gross Income Quantiles
% Change in savings
0
-1
-2
-3
-4
-5
-6
1
2
3
4
5
2019 Gross Income Quantiles

Take me back!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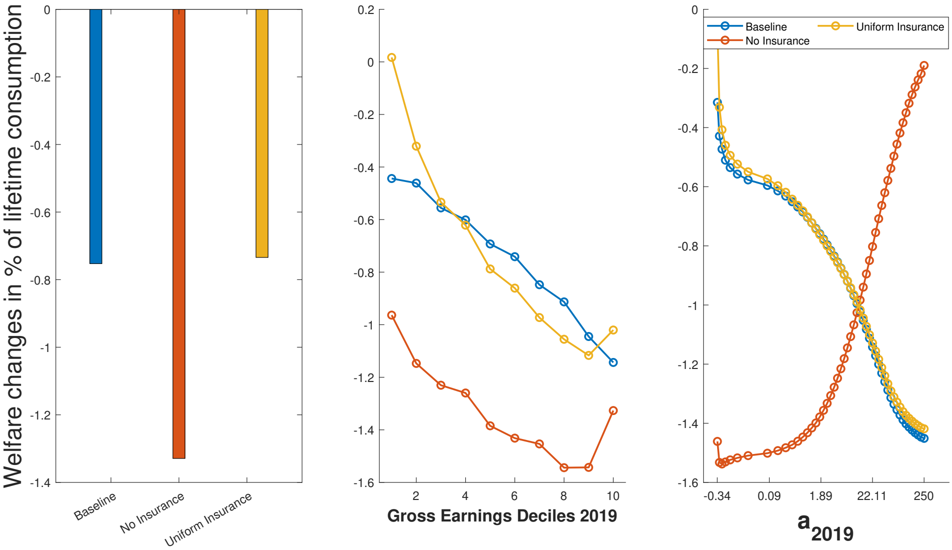
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