Welfare and Spending Effects of Consumption Stimulus Policies

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Motivation

- Various fiscal policies used to fight recessions: payroll tax cuts, stimulus checks, UI extension
  - little guidance from traditional RANK models
  - different goals: increase output (a 'GDP metric') or reduce misery (a 'welfare metric')

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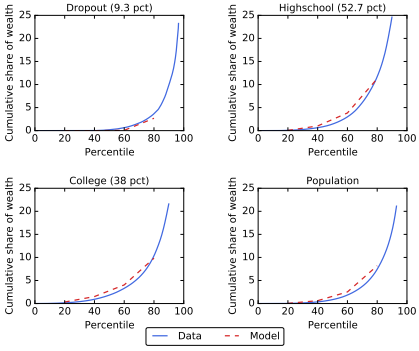
- **This paper:** Develop a heterogeneous agent (HA) model to study effectiveness of policies in fighting recessions
  - Consumers subject to transitory & permanent income shocks and unemployment risk, heterogeneous in education
  - Consistent with micro data
  - Not a HANK model, but aggregate demand multiplier exist during recessions

Model consistent with micro data

SCF liquid wealth (Kaplan and Violante, 2014)



Modelling device: *Ex-ante* heterogeneity in discount factors

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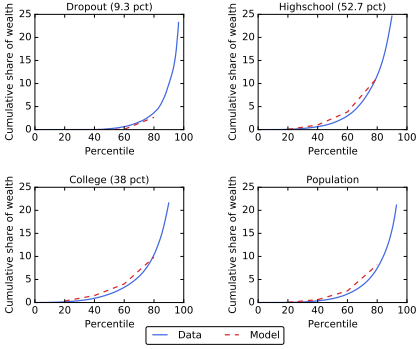
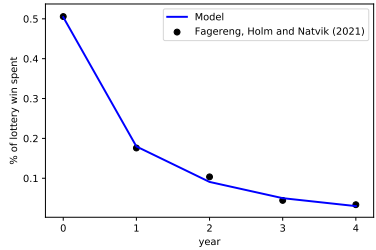


Modelling device: *Ex-ante* heterogeneity in discount factors

iMPC from Fagereng, Holm, Natvik (2021)



Modelling device: 'Splurge' in consumption, i.e. exogenously given fraction of income directly consumed

Parametrization strategy Calibrated parameters Estimated parameters & fit

Evaluation of consumption stimulus policies in the US

- Policies we consider:
  - Stimulus check for $1200 (means-tested)
  - Extension of unemployment benefits from 0.5 to 1 year
  - Payroll tax cut by 2% for 2 years
- Evaluation criteria:
  - Spending multipliers
  - Welfare (only recession-related welfare impact)

Preview of results

- Welfare measure: Extension of UI benefits is the clear winner
  - Targeted at individuals with high MPCs and high recession-related welfare losses
  - But: higher spending may continue after recession is over
- Spending multiplier: Stimulus check has the highest multiplier
  - Not well targeted, but increases income immediately
- Tax cut
  - Poorly targeted and much spending likely to occur after end of recession

Related literature

- **Effects of transitory income shocks**: Parker, Souleles, Johnson and McClelland (2013); Broda and Parker (2014); Fagereng, Holm and Natvik (2021); Ganong, Greig, Noel, Sullivan and Vavra (2022)
- **HA models consistent with high MPCs**: Kaplan and Violante (2014); Auclert, Rognlie and Straub (2018); Carroll, Crawley, Slacalek and White (2020); Kaplan and Violante (2022)
- **State dependent multipliers (ZLB)**: Christiano, Eichenbaum and Rebelo (2011); Eggertson (2011); Ramey and Zubairy (2018); Hagedorn, Manovskii and Mitman (2019)
- **Welfare measures in HA models**: Bhandari, Evans, Golosov and Sargent (2021); Dávila and Schaab (2022)
- **Extended unemployment insurance**: Ganong, Greig, Noel, Sullivan and Vavra (2022); Kekre (2022)

Model

Consumer problem

- Education groups: "Dropout", "Highschool" and "College"
- Each group has distribution of subjective discount factors β_i
- Idiosyncratic, stochastic income process $\mathbf{y}_{i,t}$
- Estimated splurge factor ς: $\mathbf{c}_{sp,i,t} = \varsigma \mathbf{y}_{i,t}$

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- Remaining consumption $c_{opt,i,t}$ is chosen to maximize utility

$$\sum_{t=0}^{\infty} \beta_i^t (1-D)^t \mathbb{E}_0 u(\mathbf{c}_{opt,i,t}). \tag{1}$$

(D: end-of-life probability, u: stand. CRRA utility func.)

- Budget constraint, given existing market resources $m_{i,t}$ and income state, and a no-borrowing constraint:

$$\mathbf{m}_{i,t+1} = R \underbrace{(\mathbf{m}_{i,t} - \mathbf{c}_{sp,i,t} - \mathbf{c}_{opt,i,t})}_{\geq 0 \text{ (no-borrowing constraint)}} + \mathbf{y}_{i,t+1} \tag{2}$$

(R: exogenous gross interest rate)

Income process

- Income subject to transitory, unempl. and permanent shocks

$$\mathbf{y}_{i,t} = \begin{cases} \xi_{i,t}\mathbf{p}_{i,t}, & \text{if employed} \\ 0.7\mathbf{p}_{i,t}, & \text{if unemployed for} \leq 2\text{q} \\ 0.5\mathbf{p}_{i,t}, & \text{if unemployed} \geq 2\text{q} \end{cases} \tag{3}$$

($\xi_{i,t}$: trans. shock, p: perm. income)

- "Permanent income": $\mathbf{p}_{i,t+1} = \underbrace{\psi_{i,t+1}}_{\text{perm. shock}} \quad \underbrace{\Gamma_{e(i)}}_{\text{educ.-specific growth}} \quad \mathbf{p}_{i,t}$

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- Emplyoment status is subject to a Markov process
  - Unemployment rate education-specific (doubles in recession)
  - Expected length of unemployment: 1.5q (4q in recession)
- Recession is given by an MIT shock; end of recession as a Bernoulli process (avg. length of 6q)

Aggregate demand effects

(as in Krueger, Mitman and Perri, 2016)

- Baseline: No feedback from aggregate consumption to income
- Extension: We allow for aggregate demand effects from consumption on income during the recession
- The AD effect is given by

$$AD(C_t) = \begin{cases} \left(\frac{C_t}{\tilde{C}}\right)^{\kappa}, & \text{if in a recession} \\ 1, & \text{otherwise,} \end{cases} \tag{4}$$

  where $\tilde{C}$ is the level of consumption in the steady state.

- Idiosyncratic income in the extension model is then given by

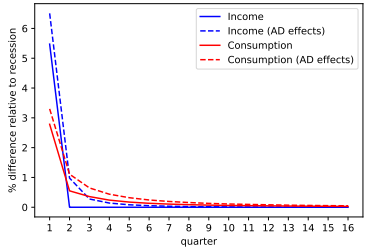
$$\mathbf{y}_{AD,i,t} = AD(C_t)\mathbf{y}_{i,t}. \tag{5}$$

Results

Impulse responses

- Simulate policies in recessions lasting 1 to 20 q
- Construct probability-weighted sum across rec. lengths

Stimulus check:



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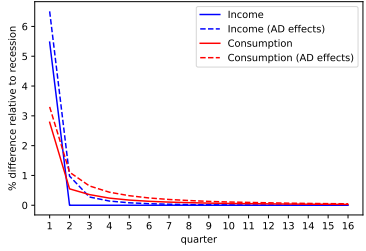
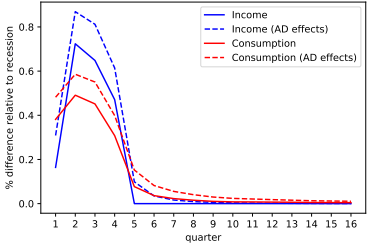
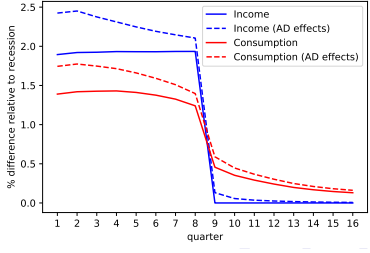


Extension of UI benefits:



Payroll tax cut:



Multipliers when aggregate demand effects are present

$$M_t^P = \frac{\text{Net present value of policy-induced consumption up to } t}{\text{Net present value of the cost of the policy}}$$

	Tax Cut	UI extension	Stimulus check
Multiplier in Q1	0.05	0.25	0.60
Long-run Multiplier	1.08	1.28	1.34
Policy expenditure during recession	57.6%	80.6%	100.0 %

Welfare measure construction

Guiding principles

1. Each consumer is valued equally by the social planner
2. Utility from splurge in the same way as other spending
3. No social benefit to the policies outside of a recession

Simple aggregation of consumer util. only satisfies principle 1 & 2:

$$\mathcal{W}(\text{policy}, Rec, AD) = \frac{1}{N} \sum_{i=1}^{N} \sum_{t=0}^{\infty} \beta_S^t u(\mathbf{c}_{it,\text{policy},Rec,AD})$$

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To satisfy principle 3, we calculate

- Net welfare: Subtract the welfare cost of financing the policy
- Recession-based net welfare: Subtract the net welfare impact of policy outside of recession

Details on welfare measure

Welfare results

	Check	UI	Tax Cut
Without AD effects	0.011	0.580	0.002
With AD effects	0.171	1.266	0.065

- All policies adjusted to the fiscal size of the UI extension
- Interpretation: A welfare gain of x $\Leftrightarrow$ social planner is indifferent between
  - the stimulus policy being implemented in response to a recession and
  - a permanent increase in the baseline consumption of the total population by x basis points (0.01% of baseline cons.)
- All policies much more effective when mulitplier present

Conclusion: Comparing the policies

- Comparison of three consumption stimulus policies in a HA model consistent with data on the distribution of liquid wealth and intertemporal MPCs
- Welfare measure: UI extension is the clear bang-for-the-buck winner
- The stiumulus check is less well targeted, but...
  - is transferred immediately ensuring that money arrives when it is most valuable
  - is more easily scaled up to provide more stimulus
- The tax cut is both poorly targeted and may yield substantial spending after the recession is over
- Framework can be used to evaluate other candidate policies

Thank you for your attention!

- Access the paper, presentation slides and code at: https://github.com/llorracc/HAFiscal

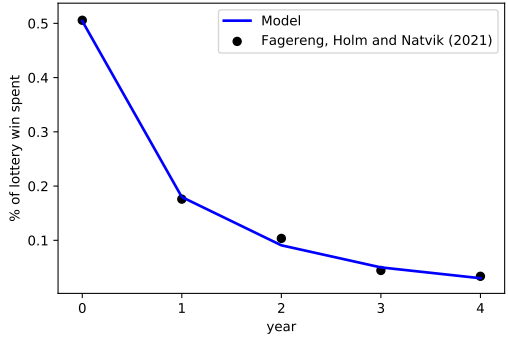
Appendix

Parametrization — Strategy

- First: Estimate the splurge factor in a Norwegian version of the economy — match iMPCs from FHN (2021)
- Calibrate a set of parameters that affect all education groups equally
- Calibrate a set of parameters that match features of the different education groups
- Estimate a discount factor distribution for each education group to match within-group distribution of liquid wealth
  - β_e: center of discount factor distribution
  - ∇_e: spread of discount factor distribution
  - Uniform distribution, approximated with 7 different types

Go back

iMPC from FHN (2021)



- Estimated splurge factor: $\varsigma = 0.31$
- Robustness exercise: With $\varsigma = 0$ the fit not as good.

Go back

Parameters — same for all types

Parameters that apply to all types		
Parameter	Notation	Value
Risk aversion	γ	2.0
Splurge	ς	0.307
Survival probability, quarterly	$1 - D$	0.994
Risk free interest rate, quarterly (gross)	R	1.01
Standard deviation of transitory shock	σ_ξ	0.346
Standard deviation of permanent shock	σ_ψ	0.0548
Unemployment benefits replacement rate (share of PI)	ρ_b	0.7
Unemployment income w/o benefits (share of PI)	ρ_{nb}	0.5
Avg. duration of unemp. benefits in normal times (quarters)		2
Avg. duration of unemp. spell in normal times (quarters)		1.5
Probability of leaving unemployment	π_{ue}	0.667
Consumption elasticity of aggregate demand effect	κ	0.3

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Parameters — by education group

Parameters calibrated for each education group			
	Dropout	Highschool	College
Percent of population	9.3	52.7	38.0
Avg. quarterly PI of "newborn" agent ($1000)	6.2	11.1	14.5
Std. dev. of log(PI) of "newborn" agent	0.32	0.42	0.53
Avg. quarterly gross growth rate of PI (Γ_e)	1.0036	1.0045	1.0049
Unemployment rate in normal times (percent)	8.5	4.4	2.7
Probability of entering unemployment (π^e_{eu}, percent)	6.2	3.1	1.8

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Parameters describing the policies

Parameters describing policy experiments	
Parameter	Value
Change in unemployment rates in a recession	$\times 2$
Expected unemployment spell in a recession	4 quarters
Average length of recession	6 quarters
Size of stimulus check	\$1,200
PI threshold for reducing check size	\$100,000
PI threshold for not receiving check	\$150,000
Extended unemployment benefits	4 quarters
Length of payroll tax cut	8 quarters
Income increase from payroll tax cut	2 percent
Belief (probability) that tax cut is extended	50 percent

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Estimated parameters

Estimated discount factor distributions

	Dropout	Highschool	College
(β_e, ∇_e)	(0.694, 0.542)	(0.904, 0.099)	(0.978,0.015)
(Min, max) in approximation	(0.230, 0.995)	(0.819, 0.989)	(0.965, 0.991)

Estimation targets	Dropout	Highschool	College
Median LW/ quarterly PI (data, percent)	4.64	30.2	112.8
Median LW/ quarterly PI (model, percent)	4.64	30.2	112.8

Non-targeted moments	Dropout	Highschool	College	Population
Percent of total wealth (data)	0.8	17.9	81.2	100
Percent of total wealth (model)	12.4	18.6	69.0	100
Avg. annual MPC (model, incl. splurge)	0.79	0.78	0.54	0.69

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Robustness: Different replacement rates

- Discount factor distributions:

			Dropout		Highschool		College	
		Splurge	β	∇	β	∇	β	∇
Basel.	($\rho_b = 0.7$, $\rho_{nb} = 0.5$)	0.307	0.694	0.542	0.904	0.099	0.978	0.015
Alt.	($\rho_b = 0.3$, $\rho_{nb} = 0.15$)	0.307	0.599	0.687	0.852	0.159	0.968	0.028

- Welfare results:

		Stimulus check	UI extension	Tax cut
no AD effects	Baseline ($\rho_b = 0.7$, $\rho_{nb} = 0.5$)	0.011	0.580	0.002
	Altern. ($\rho_b = 0.3$, $\rho_{nb} = 0.15$)	0.043	1.913	0.003
AD effects	Baseline ($\rho_b = 0.7$, $\rho_{nb} = 0.5$)	0.171	1.266	0.065
	Altern. ($\rho_b = 0.3$, $\rho_{nb} = 0.15$)	0.169	2.620	0.052

Robustness: Different interest rates

		Dropout		Highschool		College	
	Splurge	β	∇	β	∇	β	∇
$R = 1.005$	0.307	0.701	0.520	0.909	0.099	0.983	0.014
$R = 1.01$ (baseline)	0.307	0.694	0.542	0.904	0.099	0.978	0.015
$R = 1.015$	0.307	0.691	0.542	0.899	0.099	0.973	0.016

Welfare measure construction

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$$\mathcal{W}(\text{policy}, Rec, AD) = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=0}^{\infty}\beta_S^t u(\mathbf{c}_{it,\text{policy},Rec,AD})$$

- $\mathbf{c}_{it,\text{policy},Rec,AD}$: consumption paths (including splurge) for each consumer / policy
- $Rec \in \{1, 0\}$: recession indicator, $AD \in \{1, 0\}$: AD ind.
- $\beta_S = 1/R$: social planner's discount factor

Go back

Welfare measure construction II

To satisfy principle 3 we define $\mathcal{C}(\text{policy}, Rec, AD) =$

$$\Bigg(\underbrace{\frac{\mathcal{W}(\text{policy}, Rec, AD) - \mathcal{W}(\text{None}, Rec, AD)}{\mathcal{W}^c}}_{\text{I}} - \underbrace{\frac{PV(\text{policy}, Rec)}{\mathcal{P}^c}}_{\text{II}}\Bigg)$$
$$- \Bigg(\underbrace{\frac{\mathcal{W}(\text{policy}, 0, 0) - \mathcal{W}(\text{None}, 0, 0)}{\mathcal{W}^c}}_{\text{III}} - \underbrace{\frac{PV(\text{policy}, 0)}{\mathcal{P}^c}}_{\text{IV}}\Bigg)$$

- I: Policy-induced increase in agg. welfare (in bp of SS-cons.)
- II: Cost of policy $\Leftrightarrow$ I - II: Net agg. welfare increase
- III - IV: Net welfare impact of policy outside of recession
- $\mathcal{C}$ measures only welfare effects beyond pure redistribution

Go back