HANKSSON

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2nd Banca d'Italia Annual Research Conference
on Monetary Policy

June 18th, Roma

Motivation

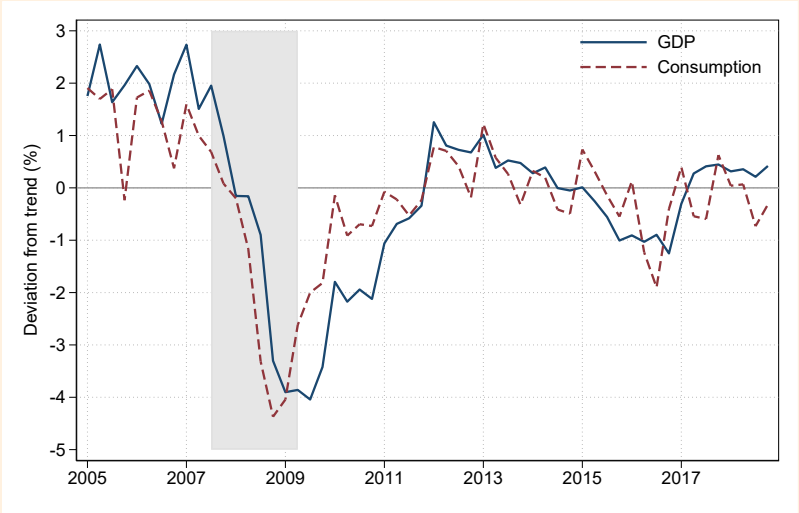
- Does heterogeneity "matter" for aggregates? (positive & normative)
- Core of HANK/TANK: two-way feedback
- Aggregate macro variables $\rightleftarrows$ distributions / inequality
- Is this salient in the data? Which heterogeneity dimensions?
- First use this *consumption*, income, wealth data through model lens
- **Measurement informed by (simple) organizing theory, i.e.:**

Approach: "Sufficient Statistics"

1. Calculate **Aggregate MPC** of Norway
   - Estimate *MPC distribution* of Norway:determinants? *liquid* wealth, education
   - + cyclical behavior, i.e. "**betas**":*distinguish* earnings vs total disposable income
2. *MPC-free* & **Consumption betas** by group: Hand-to-mouth vs not
   - "Great Recession" case study

- Common question: **AD amplification?** *("Multiplier")*
- → **important** Normative questions:
  - "**should**" central bank care about inequality?
  - use **policy** to insure –> mitigate recession

The Great Recession in Norway



Literature

1. TANK & HANK models: TANK: Bilbiie (several), Galí et al, Debortoli Galí etc.; HANK i.a.: McKay Reis, Kaplan et al, Auclert, Auclert et al, Bayer et al, Gornemann et al, Hagedorn et al; Broer et al, Challe et al, Ravn Sterk, Werning, Acharya Dogra, Wolf etc
   - Contribution: **Measurement**
2. MPC estimation: Earlier survey or imputed consumption, bank data
   - Shapiro Slemrod; Jappelli Pistaferri, Broda Parker, Kaplan Violante Weidner, Coronado et al., Fuster et al., Christelis et al., Aguiar Bils Boar, Misra Surico, Lewis et al, Blundell et al, Fagereng et al; Commault; Pistaferri et al.; Boehm et al, Orchard et al
   - **Actual**, representative consumption + wealth
3. Inequality (& income risk) empirical evidence: Heathcote Perri Violante (several); Guvenen et al (several), Ferrière et al, Guner et al + HANK: Bayer et al, Auclert et al, Bilbiie Primiceri Tambalotti, Kase et al, etc.
   - *Micro*: **Patterson** (2+3), Berger et al, Pekanov; MP: Holm et al, Almgren et al, Amberg et al, Coglianese et al, Ahn et al, Arellano et al
   - Transaction consumption data and administrative (gross and net) income data

Punchline: Results

Estimates based on:	**AD Amplification?**	**Key words**
Labor Earnings	**Yes**	risk
Disposable (Net) Income	**Flips:** *dampening!*	capital income taxes+transfers
Consumption	Yes (but *mild*)	liquidity / prec. savings investment

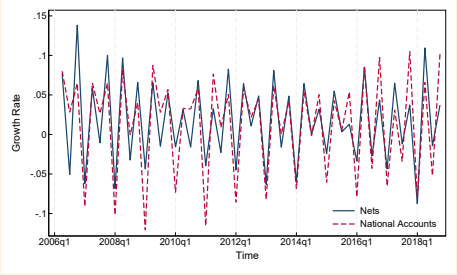
Data: Electronic Transactions And Administrative

1. Weekly electronic payments from Nets Branch Norway for all Norwegian residents 2006 - 2018.
   - Debit card + Bank wire transfers + others (cash unimportant, 3–5%)
   - Covers $\approx$ 80 percent of all electronic payments.
2. Norwegian administrative data:
   - Detailed income and wealth/debt data from Tax Registry.
   - Demographic and labor market information.

Comparison with National Accounts

Level

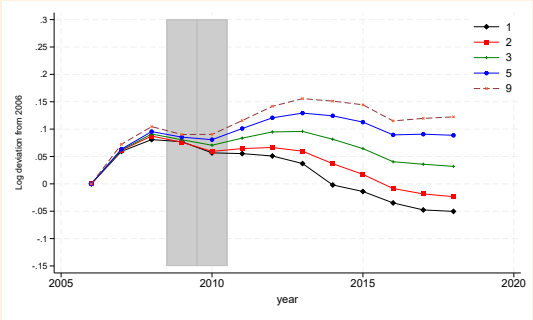
Quarterly growth rates



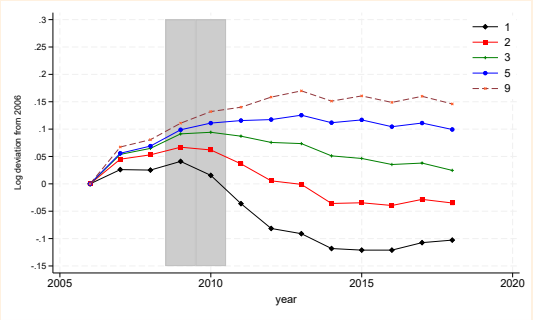
- National Accounts: Domestic hh consumption, excl. imputed owner-occupied housing.
- Nets: Electronic transactions, excl. imputed "mortgage payments" and large transactions ($> 100K$)
- Level average: 90% of NA; Correlation: 0.83

Inequality: By Income

Disposable Income



Consumption



Heathcote Perri Violante - style

Sufficient Statistic 1:
"Aggregate MPC of Norway"
= MPCs & Income betas

Keynesian Cross (Samuelson 1948)

- Generic aggregate consumption function, "Planned Expenditure"

$$C = C(Y, R, ...), \text{ with slope } MPC \equiv \frac{\partial C}{\partial Y}$$

- Effect of dR (any AD shift G, transfers, etc.)

$$\frac{dC}{dR} = MPC\frac{dY}{dR} + \frac{\partial C}{\partial R}$$

Note $\frac{\partial C}{\partial R}$ "autonomous expenditure"

- Add $C = Y$: **GE** amplification (~**any** demand shock)

$$GE \text{ Multiplier } \frac{dC}{dR} = \frac{1}{1 - MPC}\frac{\partial C}{\partial R} \tag{1}$$

New Keynesian Cross: Two Agents

- analytical TANK Bilbiie 2008 JET, 2020: $\lambda \in (0,1)$ HtM, rest Savers:

$$\mathbf{A}MPC = \tilde{\lambda}_y \times MPC^H \times \beta_y^H + \left(1 - \tilde{\lambda}_y\right) \times MPC^S \times \beta_y^S$$

  - *Elasticities* individual-to-aggregate (**betas**): $\beta_y^j \equiv dy_t^j / dy_t$ (and $\tilde{\lambda}_y \equiv \lambda Y^H / Y$)

- S's log-lin Euler (but $c_t^j = y_t^j$ for both!):

$$c_t^S = E_t c_{t+1}^S - \sigma r_t \tag{2}$$

GE Multiplier of r cut (~**any** demand shock):

$$\frac{dc_t}{d\left(-r_t\right)} = \sigma\left(1 - \tilde{\lambda}_y\right) \frac{1}{1 - \tilde{\lambda}_y \beta_y^H}$$

- **Amplification** iff *countercyclical income inequality*, $\beta_y^H > 1$

$$\frac{d\left(y_t^S - y_t^H\right)}{dy_t} = \beta_y^S - \beta_y^H = \frac{1 - \beta_y^H}{1 - \tilde{\lambda}_y} < 0$$

New Keynesian Cross: Many Agents

- HA generalization: Auclert 2019, *Measurement*: Patterson 2023
- all $C^j = Y^j \rightarrow$ GE MPC (**any** demand shock: MP, fiscal, financial):

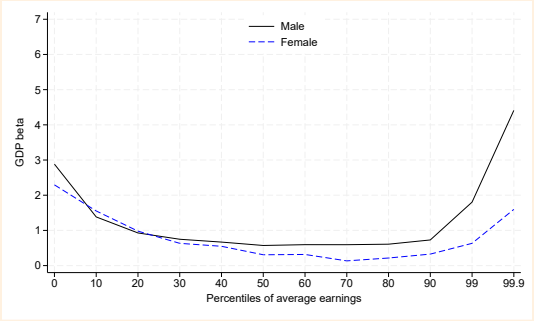
$$\begin{aligned}\mathbf{A}MPC = \frac{dC}{dY} &= \sum_j \frac{dC^j}{dY^j}\frac{dY^j}{dY} = \sum_j MPC^j \frac{Y^j}{Y}\beta_y^j \\ &= \underbrace{\sum_j \frac{Y^j}{Y} MPC^j}_{aMPC} \sum_j \beta_y^j + \text{cov}(MPC^j, \beta_y^j)\end{aligned}$$

- *Amplification*:

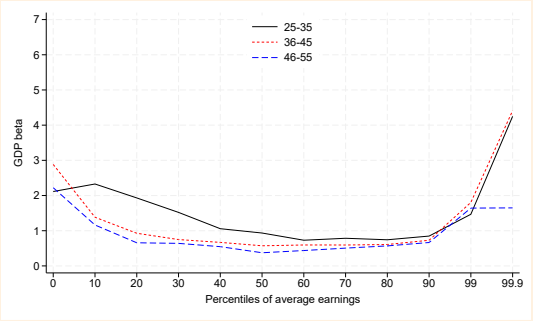
$$\text{cov}(MPC^j, \beta_y^j) > 0 \Leftrightarrow \mathbf{A}MPC > aMPC\big|_{\beta_y^j=1} \Leftrightarrow \frac{1 - aMPC}{1 - \mathbf{A}MPC} > 1$$

"Worker Betas": Redo Guvenen et al 2017 for Norway

Gender



Age



- earnings per groups g: gender, four age groups, 12 percentile bins;

$$\Delta y_{i,t} = \alpha_g + \beta_g \Delta y_t + \varepsilon_{i,t},$$

y_{it} log real individual earnings, y_t log real GDP

MPC Distribution of Norway

- Estimated à la Patterson 2023 AER, Gruber 1997 AER:

$$\Delta C_{i,t} = \sum_x (\mu_x \Delta Y_{i,t} \times x_{i,t-1} + \alpha_x x_{i,t-1}) + \delta_{t,s} + \varepsilon_{i,t},$$

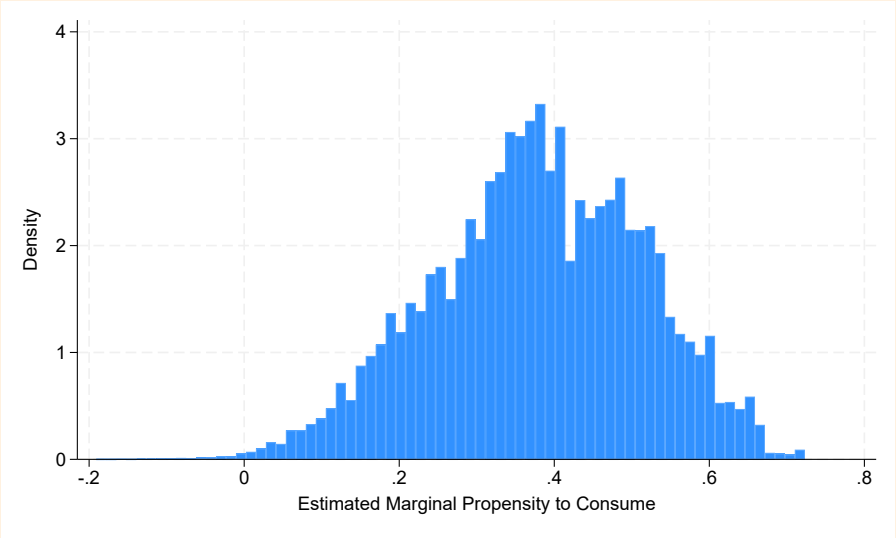
  $C_{i,t}$ total household consumption of individual i, $Y_{i,t}$ **disposable income**, $x_{i,t}$ individual characteristics (age, gender, lagged income bins, wealth, etc.)

- Instrument $\Delta Y_{i,t}$ with becoming unemployed u from $t-1$ to t
  - Advantage: typical BC shock experienced by workers, large, well powered
  - Disadvantage: heterogeneous persistence? (No!–revised paper)
- Impute MPC for all person-years using their x vector

$$\widehat{MPC}_{i,t} = \sum_x \mu_x x_{i,t-1}$$

- **robustness**: i. lotteries (Fagereng Holm Natvik); ii. Blundell Pistaferri Preston; Commault; iii. Braxton Herkenhoff Rothbaum Schmidt; iv. β-implied MPCs

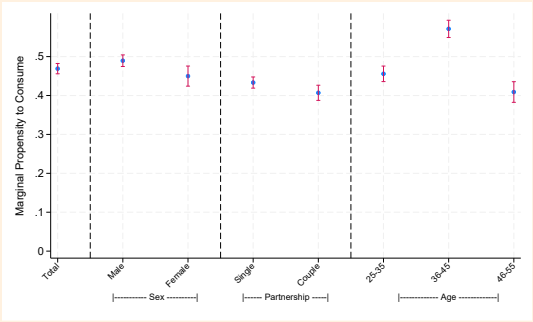
MPC Distribution of Norway

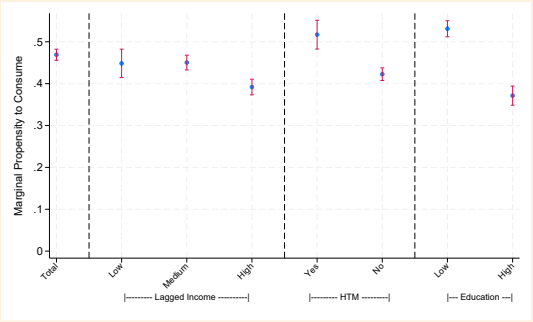


MPC Robustness: Persistence

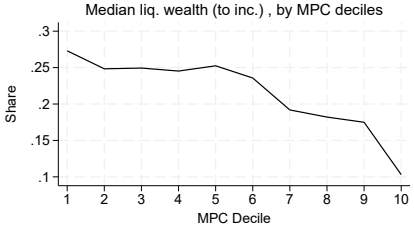
- want "transitory" shocks (bias from unemployment persistence)
- apply Commault version of Blundell Pistaferri Preston (BPP-C)
- slightly lower magnitude (less dispersion): 0.3 p.a. ~Commault U.S.
- **lottery** estimates: 0.317: Braxton et al: 0.19

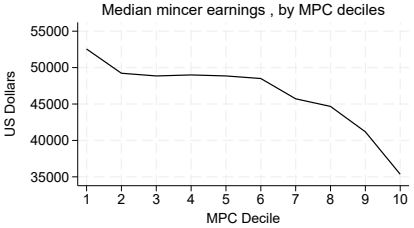
MPC Determinants

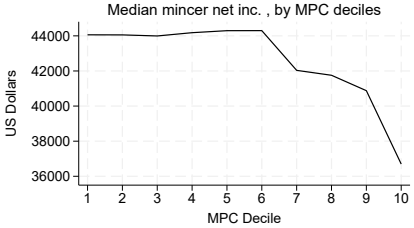


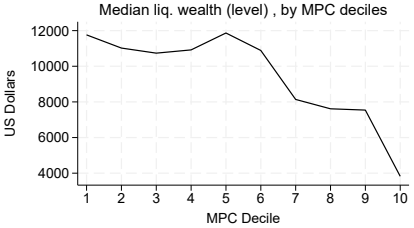


Liq. wealth & Mincerian income by MPC









Sufficient Statistics 1: The Aggregate MPC

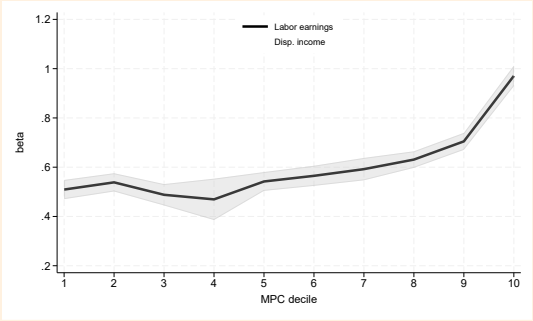
- use "betas" (as in Guvenen et al) **but**

1. for the MPC distribution (same as Patterson 2023) and
2. also for *disposable* income (**new**)

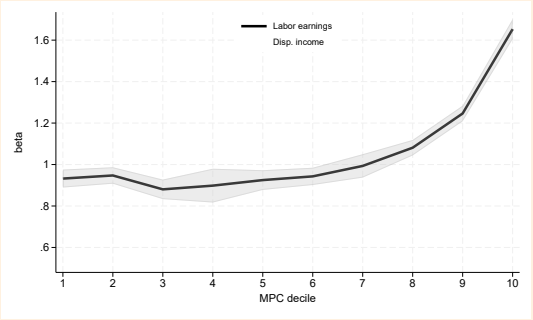
- combine with information on shares to compute: **aggregate MPC**
- (Later: also for *consumption*, group by HtM, wealth, education)

Betas Across the MPC Distribution

w.r.t. GDP

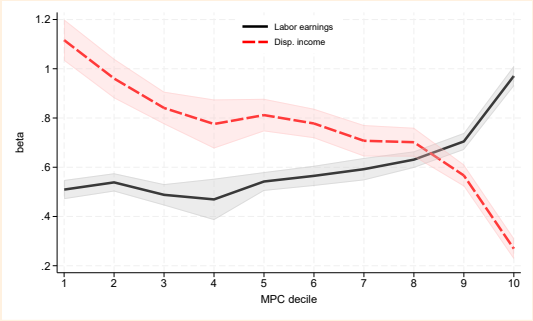


w.r.t. AggregateD Indiv. Incomes



Betas Across the MPC Distribution

w.r.t. GDP



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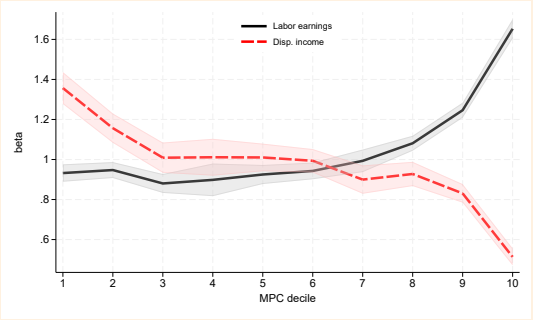
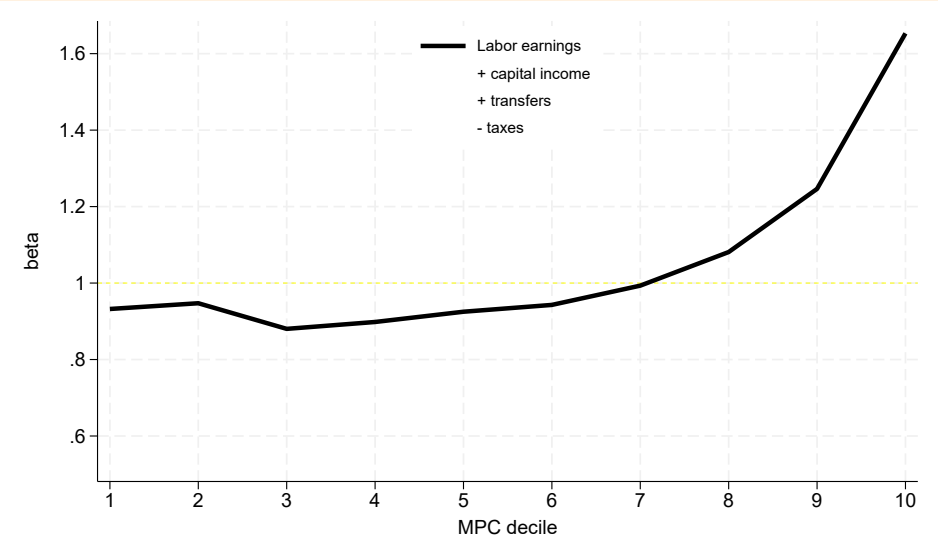


From Earnings to Net Income Betas: A Decomposition



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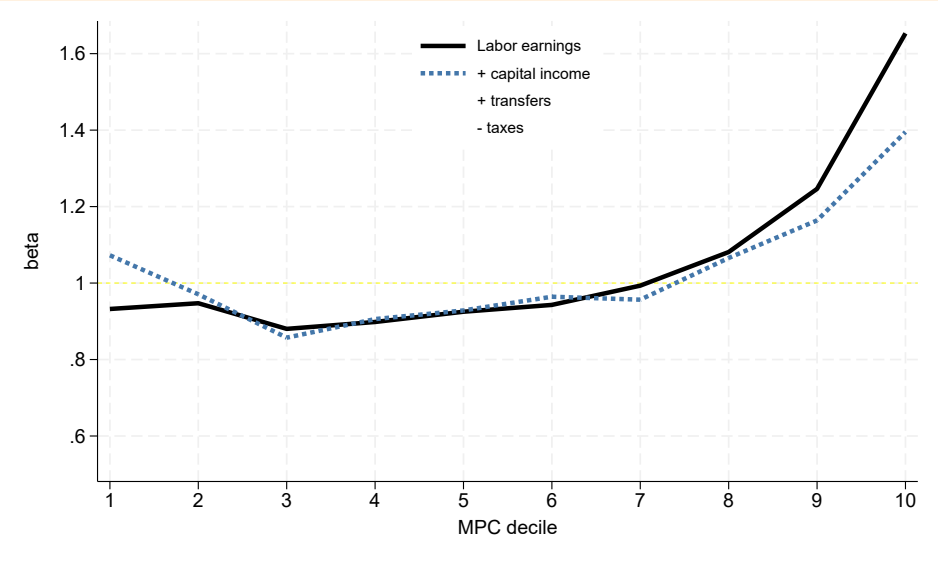

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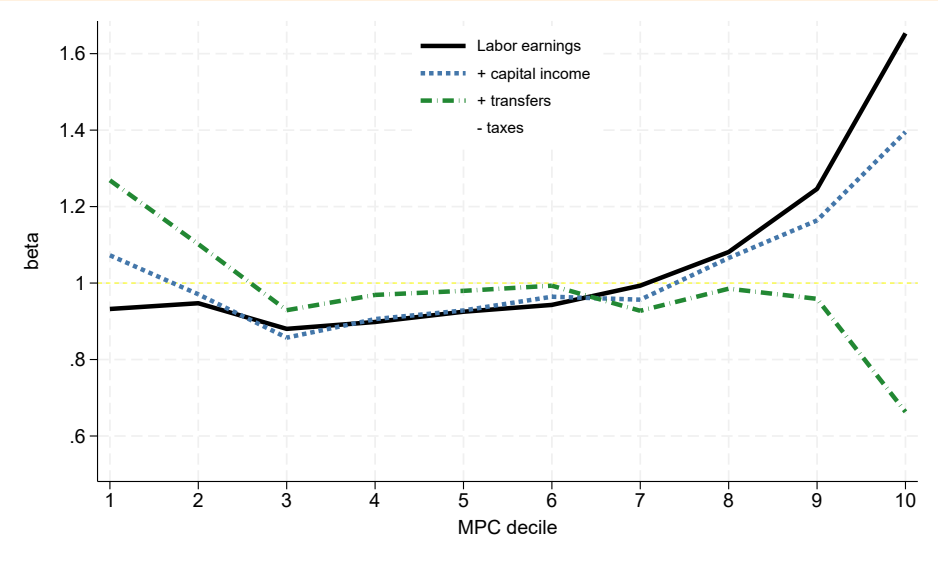

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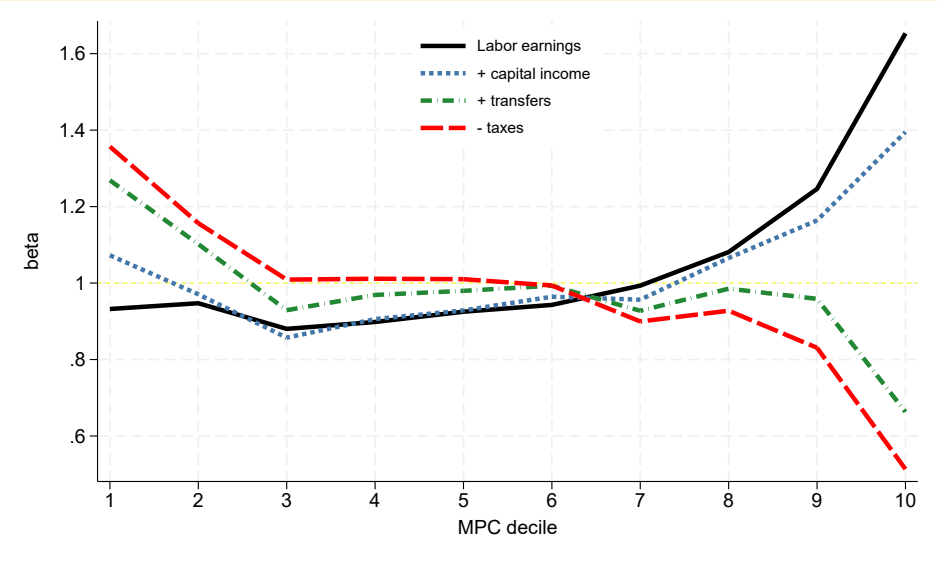
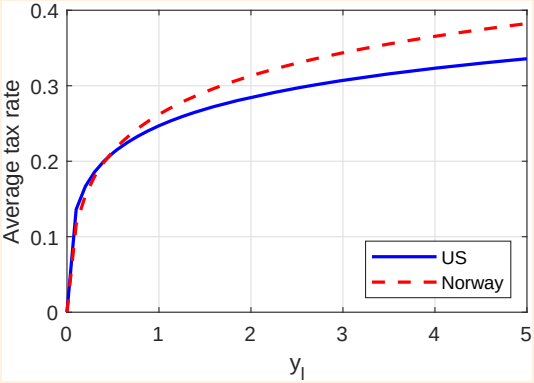
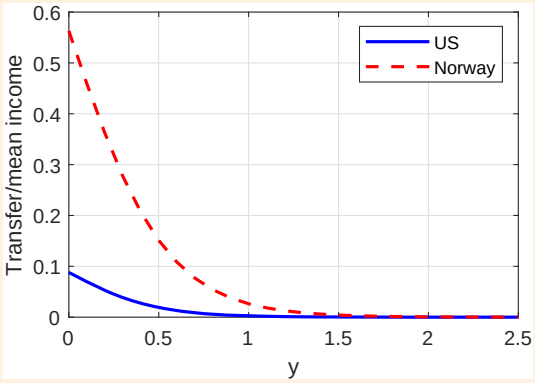


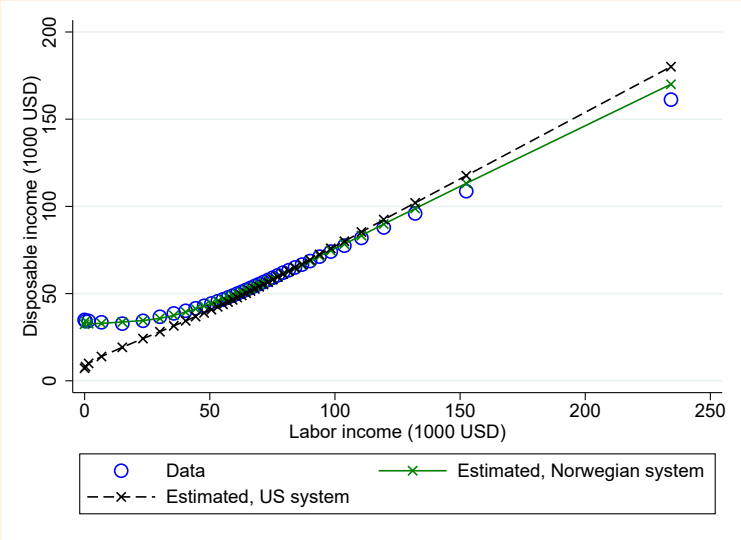
Is this just Norway? A ""Counterfactual""



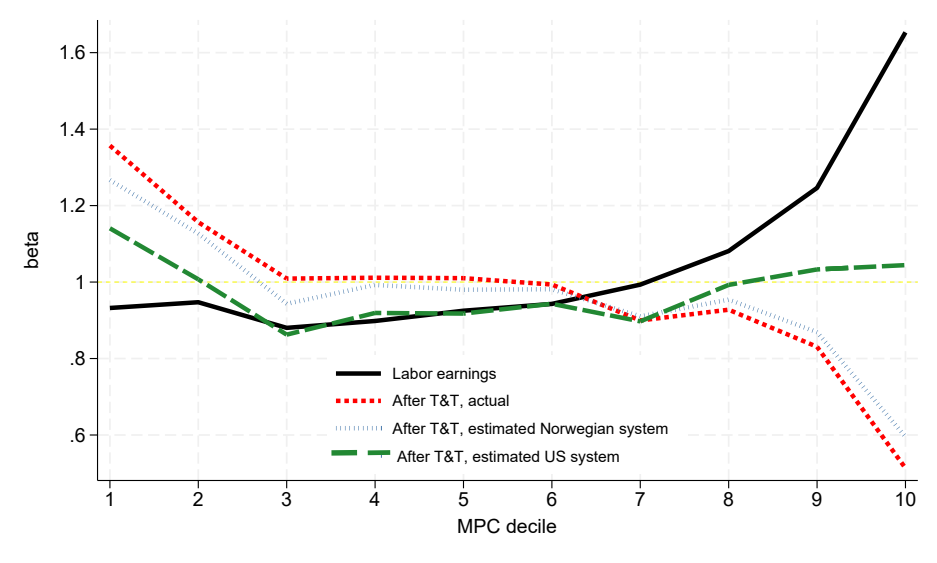


- Estimate tax function as in Ferrière Grübener Navarro (extending Heathcote Storesletten Violante)

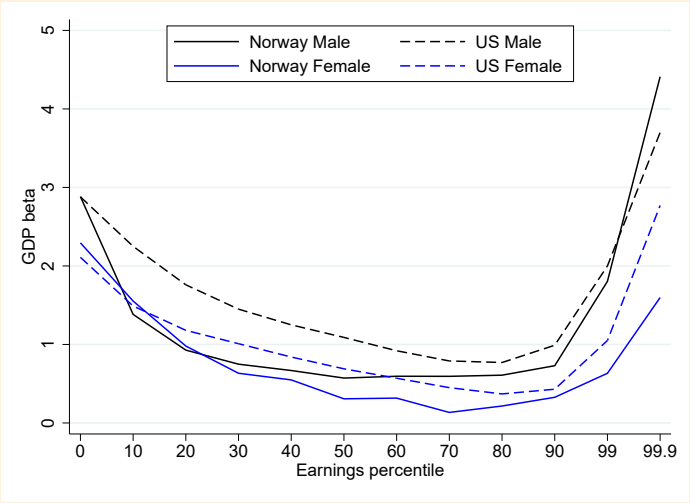
Norway: Particularly generous at the bottom



US Tax & Transfer ""Counterfactual""



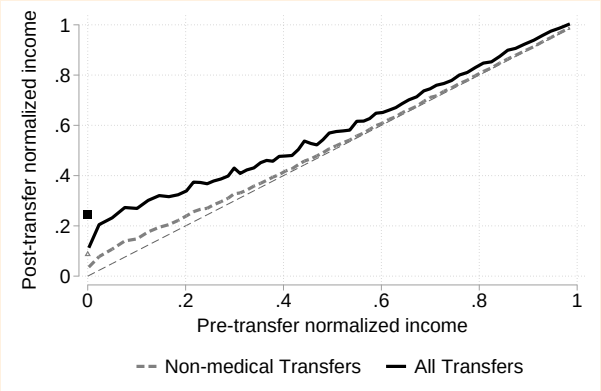
"Worker Betas": Norway ~ US (!)



US Also (!) "Generous at the bottom"

Guner Rauh Ventura: Adding Medicaid

Figure 2: Relation between Pre- and Post-Transfer Income



Qiu-Russo (HSV method)*

Country	Progressivity	Rel. to U.S.
Germany	0.133	2.8×
United States	**0.046**	**1.0**×
Japan	0.049	~1.1×
Norway	**0.054**	**1.2**×

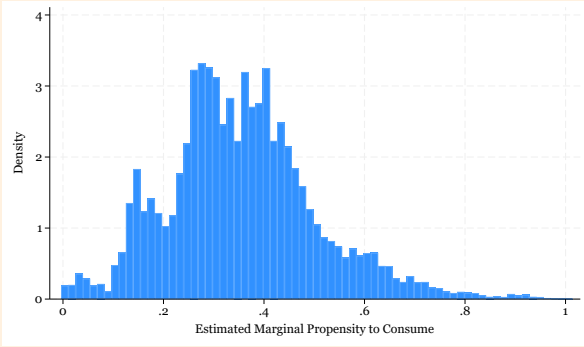
*Luxemburg Income Study Survey

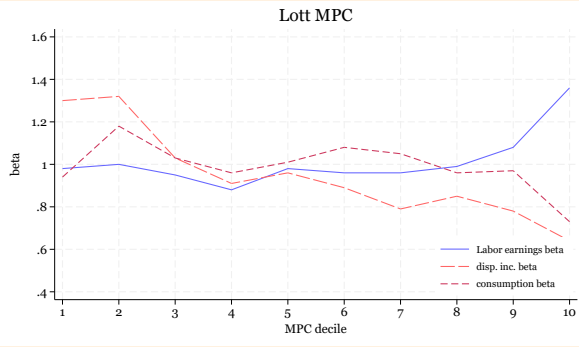
Aggregate MPC and KC Multiplier of Norway

Income measure	AMPC	avg. MPC	cov(MPC,β)	Multiplier A	Multiplier a	A/a*
Labor income	.428	.397	.0307	1.748	1.659	1.053
+ capital	.407	.397	.010	1.687	1.659	1.017
+ transfers	.361	.397	-.0357	1.566	1.659	0.944
- taxes	.352	.397	-.045	1.543	1.659	0.930
US counterfact.	.387	.397	-.009	1.632	1.659	0.984

*compute $\frac{1-aMPC}{1-\mathbf{A}MPC}$

Lottery Winnings Estimates





Aggregate MPC and Multiplier: Lottery Estimates

Income measure	AMPC	avg. MPC	cov(MPC,β)	A/a*
Labor earnings	.327	.317	.01	**1.015**
Net total income	.288	.317	-0.29	**0.959**

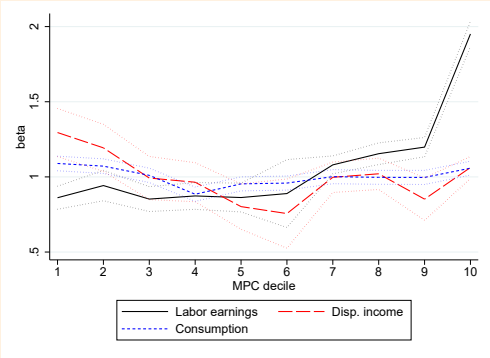
*compute $\frac{1-aMPC}{1-\mathbf{A}MPC}$

Amplification: 3 Different Estimates

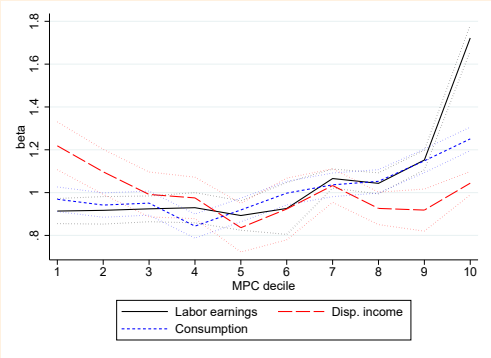
Income measure	Lottery	Braxton et al	BPP-Commault
Labor earnings	1.015	1.011	1.014
Net total income	0.959	0.978	1.004

compute $\frac{1-aMPC}{1-\mathbf{A}MPC}$

Conditional Betas: Monetary Policy Shocks



Holm Paul Tischbirek



Ahn Galaasen Maehlum

Sufficient Statistic 2: MPC-free Amplification

"Consumption Betas"

Sufficient Stat. 2: "Consumption Betas"

- same simplest analytical TANK Bilbiie 2008 JET: S's log-lin Euler:

$$c_t^S = E_t c_{t+1}^S - \sigma r_t \tag{3}$$

- Consumption inequality $\Gamma_t \equiv C_t^S / C_t^H$, log deviations

$$\gamma_t = c_t^S - c_t^H \tag{4}$$

- Rewrite the aggregation $c_t = \tilde{\lambda}_c c_t^H + \left(1 - \tilde{\lambda}_c\right) c_t^S$, with $\tilde{\lambda}_c \equiv \lambda C^H / C$

$$c_t = c_t^S - \tilde{\lambda}_c \gamma_t \tag{5}$$

- $\rightarrow$ aggregateD Euler $\approx$ proto-"Master equation":

$$c_t = E_t c_{t+1} - \tilde{\lambda}_c \left(\gamma_t - E_t \gamma_{t+1}\right) - \sigma r_t \tag{6}$$

Consumption Inequality: Sufficient Statistic for AD

- AD *amplification* iff *countercyclical* **consumption** inequality

$$\gamma_c \equiv \frac{d\gamma_t}{dc_t} < 0 \iff \beta_c^H > \beta_c^S. \tag{7}$$

  - C & wealth data→split participants or not, MPC-free
- GE multiplier (of say one-time MP)

$$\frac{dc_t}{d\left(-r_t\right)} = \sigma \frac{1}{1+\tilde{\lambda}\gamma_c} \tag{8}$$

- Identical with Suff. Stat. 1 when $c^j = y^j$

$$\frac{1}{1+\tilde{\lambda}\gamma_c} = \frac{1-\tilde{\lambda}_y}{1-\tilde{\lambda}_y\beta_y^H} = \frac{1-aMPC}{1-\mathbf{A}MPC}$$

  - **Same** as "covariance condition"

$$cov\left(MPC^j, \beta_y^j\right) = \tilde{\lambda}_y e^{-\rho}\left(\beta_y^H - 1\right) = \mathbf{A}MPC - aMPC$$

Consumption Inequality: Sufficient Statistic for AD

- With net saving/investment X_t, savers log-lin BC ($X_Y \equiv X/Y$):

  Galí Lopez-Salido Valles 2007

$$C_Y c_t^S + \frac{X_Y}{1-\lambda} x_t = Y_Y^S y_t^S, \tag{9}$$

  HtM still

$$c_t^H = y_t^H. \tag{10}$$

- Some algebra, use individual incomes β_y^H:

$$\gamma_t = c_t^S - c_t^H = \frac{1-\beta_y^H C_Y}{(1-\lambda)C_Y} y_t - \frac{X_Y}{(1-\lambda)C_Y} x_t. \tag{11}$$

- **Amplification** (γ_t countercyclical) despite $\beta_y^H < 1$ iff
- savings (investment) procyclical *enough*

  (Auclert Rognlie Straub; Bilbiie Känzig Surico) & (Werning; Bilbiie)

Sufficient Statistic Also for iMPC-amplification

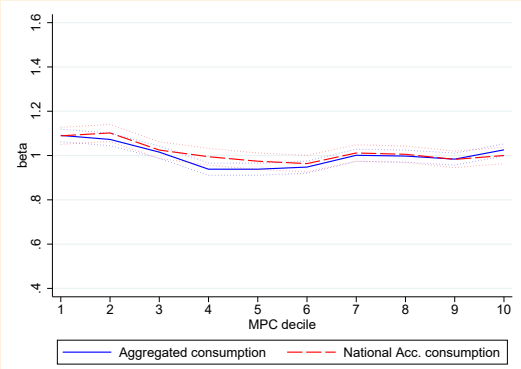
- With liquid account/iMPCs (Auclert et al; Hagedorn et al)
- Well-defined demand for liquidity (analytics from Bilbiie 2025 THANK)
- **Amplification** despite $\beta_y^H \leq 1$ iff ... γ_t countercyclical

$$\beta_c^H > \beta_c^S$$

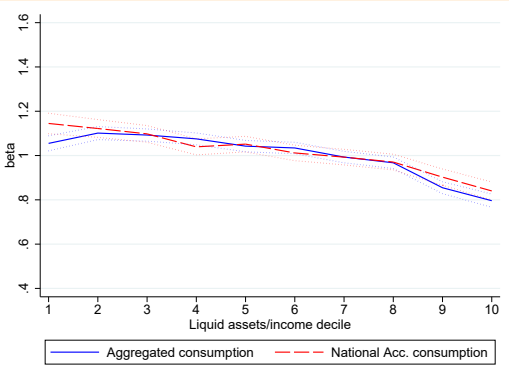
  (novel proposition)
- MP but also Deficit(-financed G) shocks
  - Encompasses "*cyclical liquidity*"(Werning; Angeletos Lian Wolf)

Consumption Betas Across the Distribution:

by MPC



by Liq. assets/income



HT Townsend | Cochrane | Mace

Income and Consumption Betas by HtM in Norway

- Split population along:
  - liquidity (absolute and relative), net worth, education
- HtM (incl. Wealthy): proxy Liquid Assets$\leq$2 wks "permanent" disp. income
  - *~Kaplan Violante Weidner (3-year average, monthly): .16 population share*
- sample results (several splits, different normalizations$\rightarrow$paper)
  - e.g. bottom 30% in Liq./Y(t-1)

Income Betas by HtM and Multipliers

	HtM Share in		Betas		Multipliers	
	Earn's	Disp. y	Earn's	Disp. y	Earn's	Disp. y
Liq.<2 wks perm y						
HtM	0.11	0.13	1.279	0.799	**1.06**	**0.97**
Non-HtM	0.89	0.87	0.962	1.031		
Liq. bottom 30% y_{t-1}						
HtM	0.25	0.27	1.16	0.859	**1.077**	**0.95**
Non-HtM	0.75	0.73	0.945	1.053		

- Similar magnitudes to AMPC – SS1
- Especially when ~ matching average MPC (~30%)

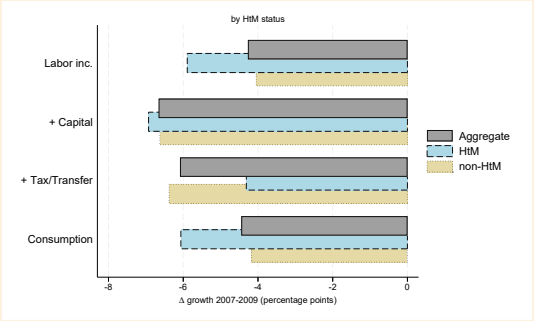
Consumption Betas by HtM and Multipliers

	Share in		Cbetas		Multipliers	
	Pop.	C	$\sum_i c_i$	NA C	$\sum_i c_i$	NA C
Liq.<2 wks perm y						
HtM	0.16	0.126	1.06	1.11	**1.009**	**1.012**
Non-HtM	0.84	0.874	.99	1.01		
Liq. bottom 30% y_{t-1}						
HtM	0.30	0.26	1.09	1.12	**1.033**	**1.04**
Non-HtM	0.70	0.74	.965	0.97		

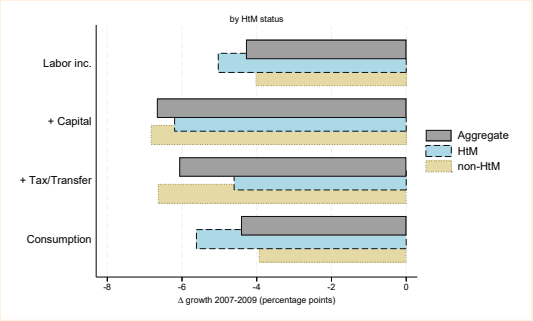
- "**Multiplier**" relative to disposable-income *dampening*? (1.009/0.97=) **1.04** to **1.094**
- $\longrightarrow$ role of *cyclical savings* channel**s**: saving/investment or liquidity/iMPCs

Case Study: A Great-Recession Decomposition

Baseline (liq.$<$ 2 wks perm. Y^j)



Generous (bottom 30% liq./Y^j_{t-1})



- betas 1.355 vs 0.948: **1.054** multiplier (**1.1** w.r.t *income-based*)
- "betas" 1.30 vs 0.89: **1.12** multiplier (**1.22** w.r.t *income-based*)
  - broadly consistent w/ Orchard Ramey Wieland; Berger Bocola Dovis

Conclusion: Amplification or Dampening?

- "Cyclical inequality" channel *close-to-irrelevant* (earnings *vs* net income)
  - theory: Bilbiie 2008 (footnote 14); general proposition: Werning 2015
  - → Automatic stabilizers ... stabilizeth!
- *Consumption* $\Longrightarrow$ *mild* amplification (larger for Great Recession)
  - saving/investment/liquidity –> other HA channels: iMPCs
  - inequality vs "income risk" distinction essential
  - → next paper(s)
- *Optimal Monetary Policy* implication: Loss Function
  - larger weight on output stabilization than RANK but... **only by 0.6%!**
- Heterogeneity **still important** for welfare & policy (GE, target transfers)

Caveat: Next Paper

- In many HANK, **cyclical risk** essential, SS2 insufficient for some types
- Bilbiie 2024 REStud (THANK) analytical formalization

$$U'\left(C_t^S\right) = \beta E_t\left\{(1+r_t)\left[s\left(Y_{t+1}\right)U'\left(C_{t+1}^S\right) + \left(1-s\left(Y_{t+1}\right)\right)U'\left(C_{t+1}^H\right)\right]\right\}$$

yields aggregated Euler "*Master equation*"

$$c_t = E_t c_{t+1} - \tilde{\lambda}\left(\gamma_t - E_t\gamma_{t+1}\right) - \sigma r_t - \underbrace{\left(1-s\right)E_t\gamma_{t+1}}_{\text{risk+cycl. ineq.}} + \underbrace{\left(\Gamma-1\right)s'\left(Y\right)E_t y_{t+1}}_{\text{ineq.+cycl. risk}}$$

- cyclicality of γ_t still sufficient for wedge 1, but not 2 (skewness)
- US data measurement: Bilbiie Primiceri Tambalotti
  - Next paper: i.a., try to measure and decompose this

TAKK!

Approach: "Sufficient Statistics"

Use the above, plus information on the average shares of the groups in income and consumption:

1. Calculate **Aggregate MPC** of Norway
   - total income changes by 1%, what is the change in aggregate consumption?
   - –> implied multiplier?
   - counterfactual with proportional incomes
2. Cyclicality of consumption *inequality* (between agents with and without Euler equation)
   - ascertain directly if amplification.
   - again counterfactual for post-2008 recession with acyclical C inequality

Sufficient Stat 1 in TANK

- simplest TANK Bilbiie 2008 JET: $\lambda \in (0,1)$ H hand-to-mouth, rest Savers:

$$\mathbf{A}MPC = \tilde{\lambda}_y \times MPC^H \times \beta_y^H + \left(1 - \tilde{\lambda}_y\right) \times MPC^S \times \beta_y^S$$

  where $\tilde{\lambda}_y \equiv \lambda \left(Y^H / Y\right)$ H group income share
- Multiplier $\rightarrow$ **MPC-free** way to gauge amplification

$$\frac{dc_t}{d\left(-r_t\right)} = \sigma \frac{1 - \tilde{\lambda}_y}{1 - \tilde{\lambda}_y \beta_y^H}$$

- "Suff. Stat. 1": *countercyclical income inequality*, $\beta_y^H > 1$

$$\frac{d\left(y_t^S - y_t^H\right)}{dy_t} = \beta_y^S - \beta_y^H = \frac{1 - \beta_y^H}{1 - \tilde{\lambda}_y}$$

- **Same** as "covariance condition"

$$cov\left(MPC^j, \beta_y^j\right) = \tilde{\lambda}_y e^{-\rho}\left(\beta_y^H - 1\right) = \mathbf{A}MPC - aMPC$$

Electronic Transactions Database

1. Weekly electronic payments from Nets Branch Norway for all Norwegian residents 2006 - 2018.
   - Debit card transactions from BankAxept system
   - Bank wire transfers processed by NICS
     - e.g all KID-payments, avtalegiro, e-faktura + others
   - Aggregation levels: person, week, zip code, consumption category.
   - Covers $\approx$ 80 percent of all electronic payments.
2. Norwegian registry data:
   - Detailed income and wealth/debt data from Tax Registry.
   - Demographic and labor market information.
3. Important detail: in Norway cash payments relatively unimportant (5-10%)

What does the transaction data set look like?

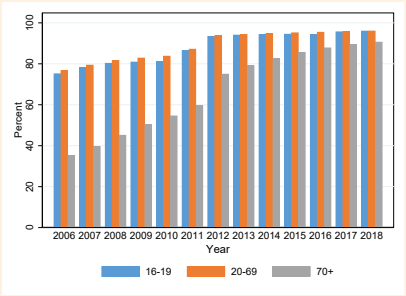
ID	year	week	coicop	zip	trans	cashback	purchase	total
570477	2015	4	1	1338	2	0	318.3	318.3
570477	2015	4	1	1390	3	0	842.19	842.19
570477	2015	4	1	3475	1	300	0.1	300.1
570477	2015	4	93	3514	2	0	120	120
570477	2015	4	111	212	1	0	70.43	70.43
570477	2015	4	111	1331	1	0	145	145

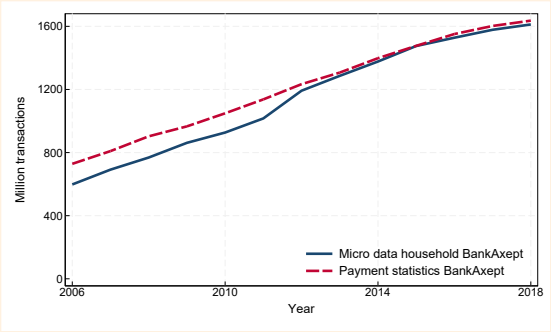
Consumption Categories

- 26 categories based on COICOP classification.
- BankAxept classified by payment terminal's MCC code.
- Wire transfers based on NACE code of firm.

1. Food and non-alcoholic beverages 2. Alcoholic beverages, tobacco and narcotics
3. Clothing and footwear 4. Housing, water, electricity, gas and other fuels
5. Furnishings, household equipment and routine household maintenance
6. Health 7. Transport (sub. cat. 71-73)
8. Communications 9. Recreation and culture (sub. cat. 91-95)
10. Education 11. Restaurants and Hotels (sub. cat. 111-112)
12. Miscellaneous goods and services (sub. cat. 121-127)
13. Payment to banks 14. Payments to public institutions

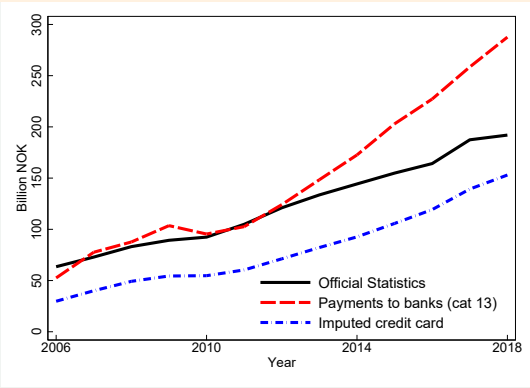
Debit card coverage (raw data)





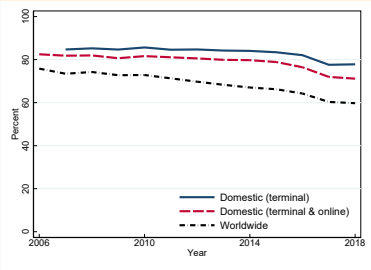
- Left: fraction of Norwegian residents with Bankaxept card transaction, by year and age groups
- Right: Total BankAxept card transactions, Official statistics vs. our micro data
- Likely that missing transactions are mostly from missing people entirely

(Imputed) Credit card coverage

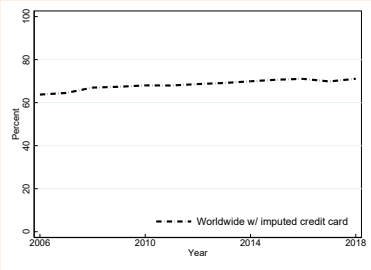


- Individual invoice payment to banks labeled as non-credit card debt if stable over time or large (above NOK 100K).
- Residual is labeled as consumption related credit card payments
- Observe only payments to banks if it goes through NICS. Likely not the case for internal transfers.

Share of card payments covered, domestic and worldwide



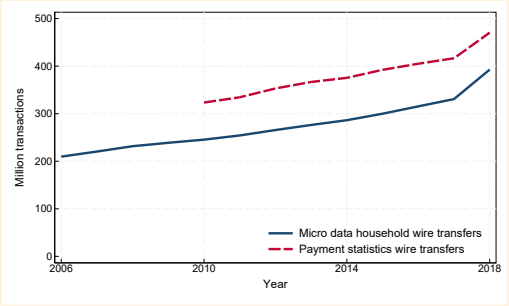
Debit Card



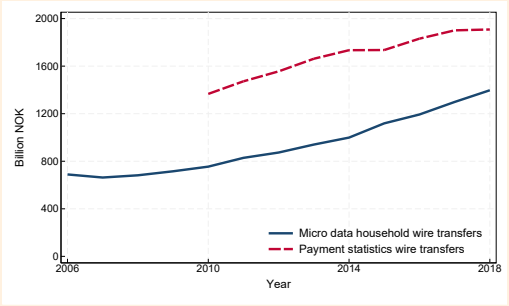
Debit + imputed credit card

- Domestic: debit card $\approx 80\%$ of total card usage by Norwegians
- Worldwide: between 60-70%. Up to 80% with imputed credit card

Wire transfer coverage (raw data)



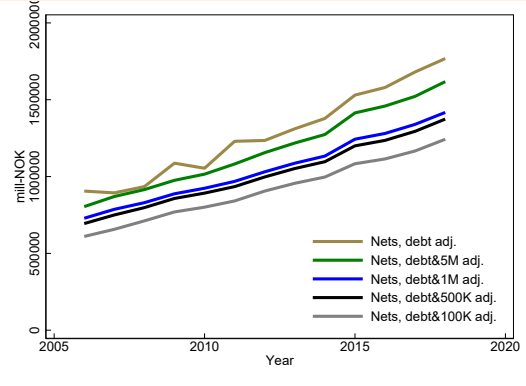
Number of transactions



Value of transactions

- Covers ≈80 percent of all transactions
- Due to very large wire transfers, lower coverage of value of transactions
- Main source of missing: internal bank transfers typically not processed by NICS

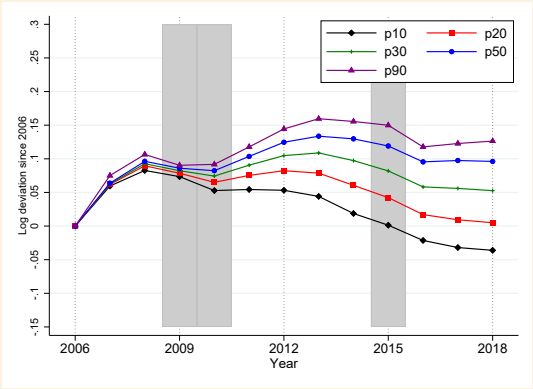
Transfers includes some very large transactions



- Transactions above NOK 100K accounts for more than 50 percent of total spending
- Our baseline: 100K cutoff.

Income and Consumption Inequality

Income



Consumption

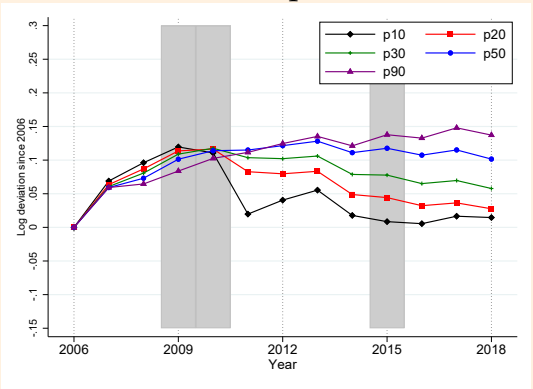


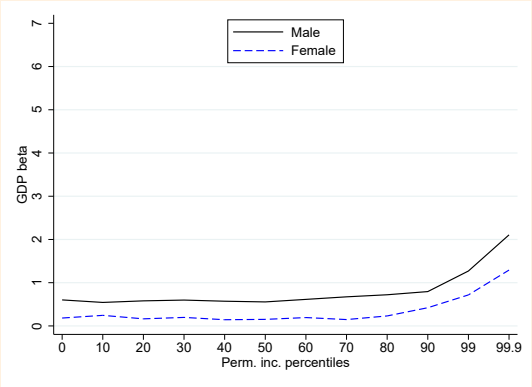
Table 1: Coefficient Estimates for Individual Marginal Propensities to Consume

Dep. Var.	ΔC
ΔI	-1.068
	(0.188)
Age	0.088
	(0.010)
Age sq.	-0.001
	(0.000)
Male	0.000
	(.)
Female	0.034
	(0.017)
1st Quintile (lagged income)	0.000
	(.)
2nd Quintile (lagged income)	-0.059
	(0.031)
3rd Quintile (lagged income)	-0.117
	(0.028)
4th Quintile (lagged income)	-0.140
	(0.027)
5th Quintile (lagged income)	-0.088
	(0.027)
< High School	0.000
	(.)
High School	-0.006
	(0.023)
Uni (lower)	-0.136
	(0.025)
Uni (higher)	-0.163
	(0.028)
Missing education	-0.173
	(0.033)
Single	0.000
	(.)
Couple	0.022
	(0.015)
Not HTM	0.000
	(.)
HTM (Net Wealth)	-0.152
	(0.020)
HTM (Liquid)	0.059
	(0.038)
HTM (Net Wealth & Liquid)	-0.017
	(0.026)
No. Observations	10558675
Year X Municip. FEs	X

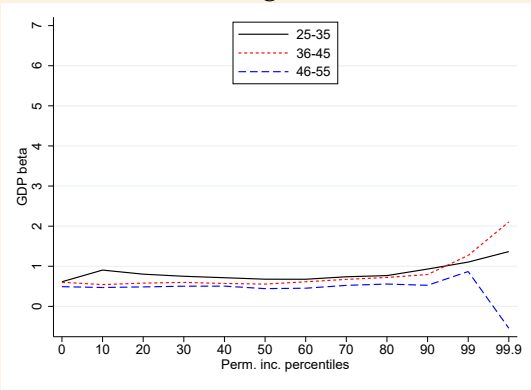
Notes:

Disposable Income Betas

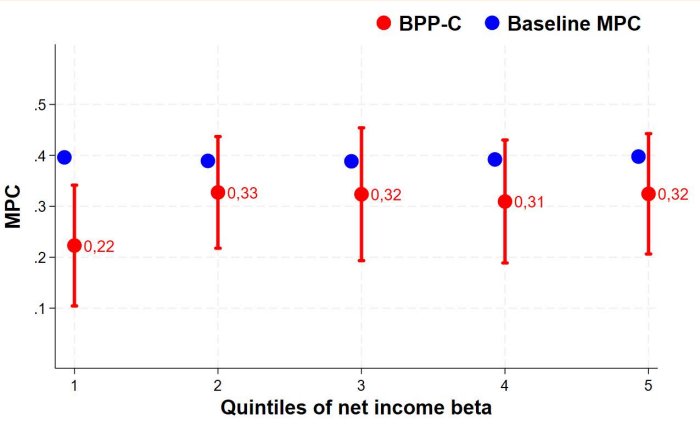
Gender



Age



Robust to BPP-C MPCs



- still flat

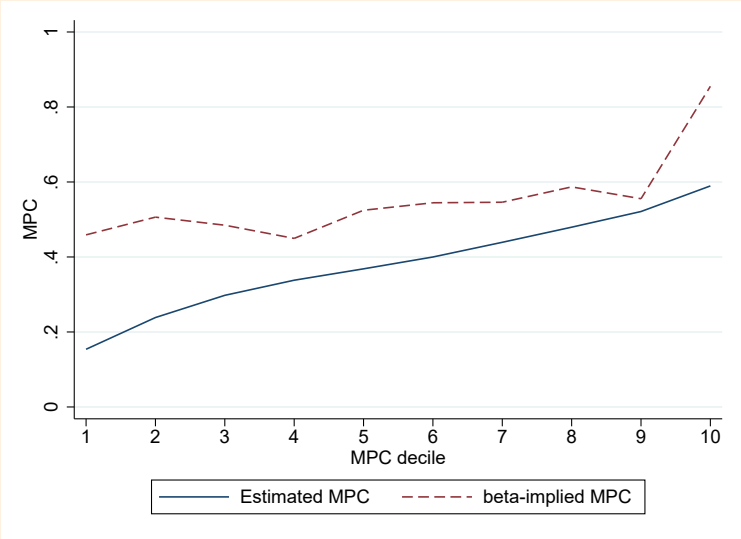
External Validation/Sanity Check: Beta-Implied MPCs

- use the two betas to compute "beta-implied MPCs" for j:

$$\frac{\beta_C^j}{\beta_Y^j} = \frac{\partial c_t^j}{\partial c_t} / \frac{\partial y_t^j}{\partial y_t}$$

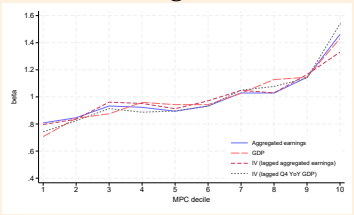
$$\rightarrow \tilde{MPC}^j = \frac{\beta_C^j}{\beta_Y^j} \frac{\partial c_t}{\partial y_t} \frac{C_t^j}{Y_t^j}$$

External Validation/Sanity Check: Beta-Implied MPCs

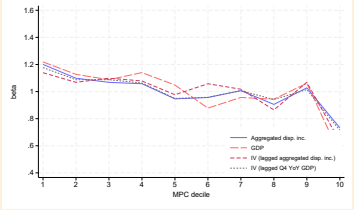


Reflection Problem?

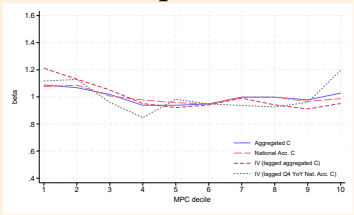
Earnings betas



Net Income betas



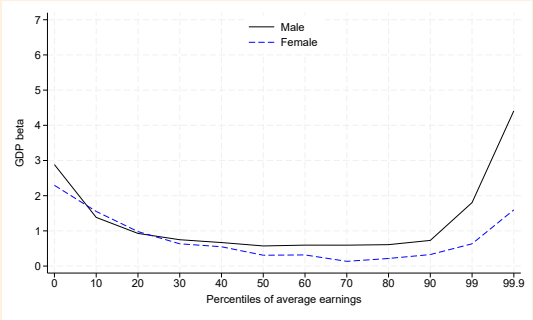
Consumption betas



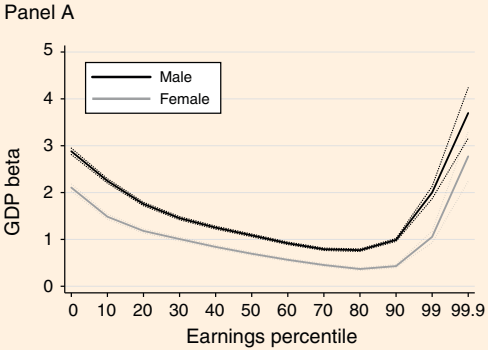
- estimates biased towards 1 ... Manski 1993
- instrument w/ past aggregate (2-stage), e.g. Flynn et al 2024

"Worker Betas": Norway ~ US (!)

Norway (ours)



US (Guvenen et al 2017)



Conclusion

- **mild** "amplification through heterogeneity"
  - earnings (5.3%), disp. income (*dampening* -7%), consumption (1 to 4%)
  - larger for Great Recession (1.12 for **consumption**, 1.22 wrt net income)
- still important: more GE, **indirect** effects!(Kaplan Moll Violante)
- automatic stabiliers ... stabilize!
- "targeted transfers" would still work
- inequality vs "income risk" distinction *essential*
- + other HA mechanisms, e.g. iMPCs
- → next paper(s)

Implications for (Optimal) Monetary Policy?

- 2nd order approximation of aggregate welfare → loss function w/ inequality (Bilbiie 2008 TANK, 2025 THANK)

$$\min_{\{c_t,\pi_t\}} \frac{1}{2} E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \underbrace{\pi_t^2 + \alpha_y y_t^2}_{\text{RANK}} + \underbrace{\alpha_\gamma \gamma_t^2}_{\text{ineq.-THANK}} \right\}$$

$$\alpha_y \equiv \left(\sigma^{-1} + \varphi\right)/\psi; \quad \alpha_\gamma \equiv \lambda\left(1-\lambda\right)\sigma^{-1}\varphi^{-1}\alpha_y$$

- generalizes to HANK (Bhandari et al, Davila Schaab, McKay Wolf, Ragot et al, etc.)
- IF γ_t little cyclical → little rationale to differ from RANK
- how little?...**0.006** Back.