

Consumption Heterogeneity: Micro Drivers and Macro Implications

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Viewpoints and conclusions stated in this paper are the responsibility of the authors alone and do not necessarily reflect the viewpoints of the Federal Reserve Board or Danmarks Nationalbank.

We estimate the **consumption response**
to permanent and transitory **shocks to income**
for **different groups** of households

Hasn't This Been Done Before?

Yes, but...

Our **method** addresses bias in previous results

Our **data** allows sharp focus on household heterogeneity

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Time Aggregation Problem

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Sample size in millions
Detailed balance sheet

What do we find? (Liquid Wealth)

Low Liquid Wealth Households:

- Hand-to-Mouth
- Spend 85 cents out of every marginal dollar, both transitory and permanent

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High Liquid Wealth Households:

- Large Response to Transitory Shocks (25 cents per dollar)
- Small Response to Permanent Shocks (60 cents per dollar)

relative to Permanent Income Hypothesis or Buffer-Stock models

What do we find? (Redistribution in Monetary Policy)



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Medium MPX
 ≈ 0.5



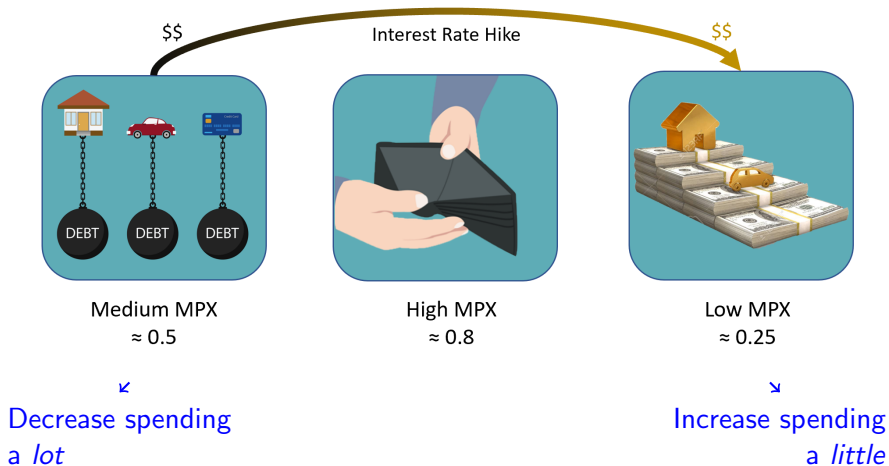
High MPX
 ≈ 0.8



Low MPX
 ≈ 0.25

MPX: Marginal Propensity to eXpend (includes durables)

What do we find? (Redistribution in Monetary Policy)



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1yr rate \uparrow 1%

Aggregate Spending \downarrow 26 basis points



Through this redistribution channel *alone*

How Do We Do This? Reduced Form Approach

Identifying Restrictions on

Income

and

Consumption

In **Continuous** Time

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Identifying Restrictions on

Income  Permanent (random walk) shocks
Transitory (<2 years) shocks

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Identifying Restrictions on

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Consumption  Permanent (random walk) response
Transitory (<2 years) response

In **Continuous** Time

How Do We Do This? Reduced Form Approach

Identifying Restrictions on

Income  Permanent (random walk) shocks
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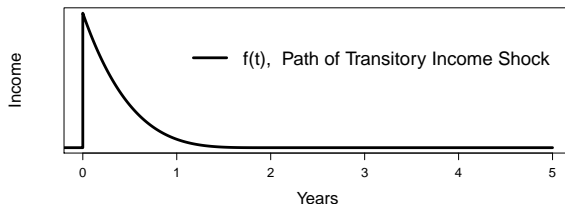
and

Consumption  Permanent (random walk) response
Transitory (<2 years) response

In **Continuous** Time  Time Aggregation Problem

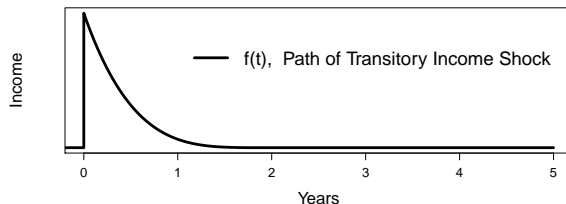
Identification Restrictions: Income Process

- Permanent Income (random walk)
- Transitory Income (persistence < 2 years)



Identification Restrictions: Income Process

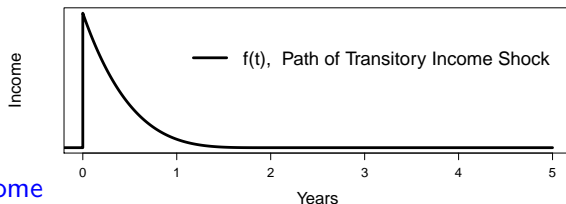
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$$y_t = \underbrace{p_t}_{\text{Permanent income flow}} + \underbrace{\int_{t-2}^t f(t-s) dq_s}_{\text{Transitory income flow}}$$

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Observed Income

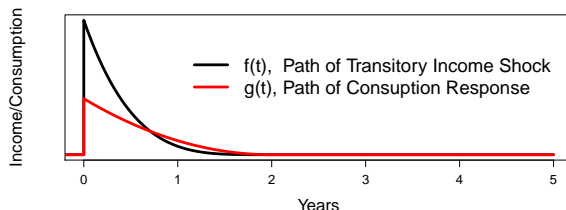
$$\bar{y}_T = \int_{T-1}^T y_t dt = \int_{T-1}^T p_t dt + \int_{T-1}^T \int_{t-2}^t f(t-s) dq_s dt$$

Time Aggregation

Identification Restrictions: Consumption Response

- Permanent: Moves by fraction ϕ of shock
- Transitory: Persistence < 2 years

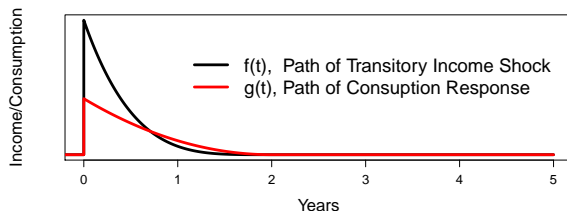
Evidence



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Evidence



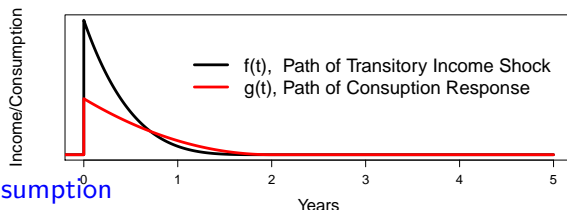
$$c_t = \underbrace{\phi p_t}_{\text{Permanent consumption flow}} + \underbrace{\int_{t-2}^t g(t-s) dq_s}_{\text{Transitory consumption flow}}$$

Permanent consumption flow Transitory consumption flow

Identification Restrictions: Consumption Response

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Evidence



Observed Consumption

$$\bar{c}_T = \int_{T-1}^T c_t dt = \int_{T-1}^T \phi p_t dt + \int_{T-1}^T \int_{t-2}^t g(t-s) dq_s dt$$

Time Aggregation

We use GMM on the equations:

$$\begin{aligned}\text{Var}(\Delta^N \bar{y}_T) &= \left(N - \frac{1}{3}\right) \sigma_p^2 + 2\sigma_{\tilde{q}}^2 \\ \text{Cov}(\Delta^N \bar{c}_T, \Delta^N \bar{y}_T) &= \phi \left(N - \frac{1}{3}\right) \sigma_p^2 + 2\psi \sigma_{\tilde{q}}^2\end{aligned}$$

with $N = 3, 4, 5$ (and $T = 2007, \dots, 2015$) to identify:

- σ_p^2 : Permanent shock variance
- $\sigma_{\tilde{q}}^2$: (Time aggregated) transitory shock variance
- ϕ : MPX out of permanent income shocks
- ψ : MPX out of transitory income shocks

where ψ is the regression coefficient of 'transitory' consumption on transitory income

What we need:

- Panel Data on **Income** and **Expenditure**
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What we have: Registry data for all Danish households

- **Income**
 - Third party reported
 - After-tax, restrict to heads aged 30-55
- **Balance Sheet**
 - Wealth on 31 Dec
 - Asset category, mortgage tenure
- **Expenditure**
 - No *direct* measure of spending

Household budget constraint

$$\text{Expenditure} = \text{Income} - \text{Saving}$$

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↓

$$= \text{Change in Net Worth (adj. for capital gains)}$$

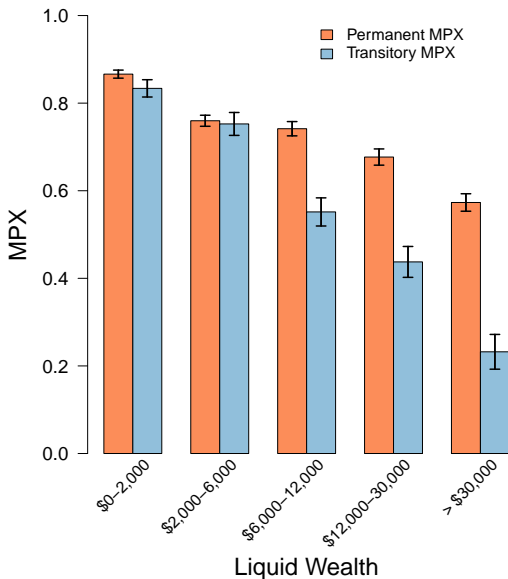
Household budget constraint

$$\text{Expenditure} = \text{Income} - \text{Saving}$$

↓
= Change in Net Worth
(adj. for capital gains)

- Works well for households with simple financial lives
- Problem: Capital gains
 - Houses off balance sheet (exclude transaction years)
 - Exclude business owners
 - Capital gains based on a diversified index
- Noisy, but perhaps better than surveys (Kuchler et al. 2018)
- Huge sample size advantage: sample covers 7.6 million observations over 2004-2015

MPX by Liquid Wealth Quintile



Monetary Policy: Interest Rate Exposure Channel

Some households pay interest

Some households receive interest

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Monetary policy redistributes between these groups

The aggregate effect depends on differences in spending response

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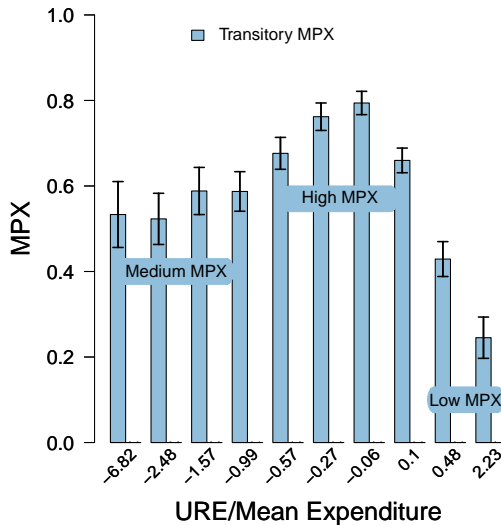
Need to know the distribution of MPX by **Unhedged Interest Rate Exposure**:

$$URE_i = Y_i - C_i + A_i - L_i$$

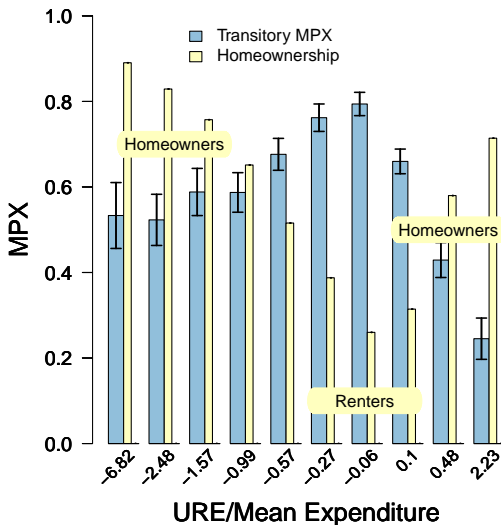
Where

- Y_i = Total after tax income
- C_i = Total Expenditure, including interest payments
- A_i = Maturing assets
- L_i = Maturing liabilities

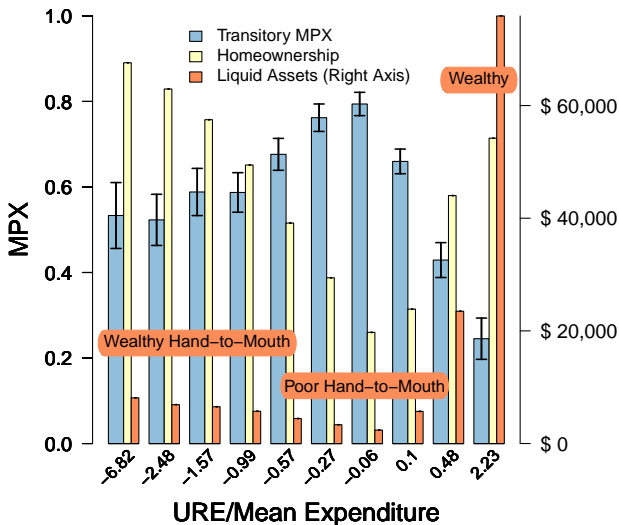
MPX by Unhedged Interest Rate Exposure



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Monetary Policy: Interest Rate Exposure Channel



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Through this redistribution channel *alone*

New Method to Estimate Consumption Behavior

- Corrects for Time Aggregation Bias
- Estimates align with natural experiment literature
- Potential to use on a wide variety of datasets and applications

Applied to Danish Registry Data

- Sample Size \implies Sharp Focus on Heterogeneity
- High MPX from transitory shocks, Low MPX from Permanent shocks
- Quantify Monetary Policy Transmission Channels

Thank you!