The Distribution of Wealth and the MPC: Implications of New European Data

Keynote Address by Christopher Carroll
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Based on joint work with
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Why Worry About the MPC ($\equiv \kappa$)?

Nobody who made a macro forecast in 2008-2012 would ask:

- In U.S. 2008-10, big ‘stimulus’ tax cuts
- In EZ, 2010-12, ‘austerity’

In either case, $\kappa$ should be central to analysis of effect

- Keynesian multipliers should be big in a liquidity trap
  (even Christiano, Eichenbaum, and Rebelo (2011)!)
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Crude Keynesianism

Multiplier is \( \frac{1}{1 - \kappa} - 1 \)

- If \( \kappa = 0.75 \) then multiplier is \( 4 - 1 = 3 \)
  - (some micro estimates of \( \kappa \) are this large)
- If \( \kappa = 0.05 \) then multiplier is only \( \approx 0.05 \)
  - (this is max \( \kappa \) in Rep Agent models; as low as 0.02)
- IMF's *mea culpa*: Our multipliers were much too low
  - \( \Rightarrow \) serious underestimate of GDP effects of austerity
  - (Blanchard and Leigh (2013))
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Wealth Distribution (U.S. Data) and Consumption Concavity (Theory)

Histogram: empirical density of \( \frac{m_t}{p_t W_t} \) (right scale)

Consumption/(quarterly) permanent income ratio for least patient
in \( \beta \)-Dist (left scale)

\( \beta \)-Point (left scale)

\( \beta \)-Dist (left scale)

for most patient in \( \beta \)-Dist (left scale)
Lorenz Curves for Income, Net Wealth; US vs Euro Area
Substantial Differences in Inequality (Gini Coefficients)
How Should Differences in Inequality Relate to the MPC?

For each country:

- Calibrate standard microeconomic consumption/saving model (with permanent/transitory income *a la* Carroll, Slacalek, and Tokuoka (2013))
- Find best-fit preference parameters (e.g., impatience):
  - Parameters s.t. model wealth distribution best matches data
- Back out implications of best-fit model for aggregate $\kappa$
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Bottom Line—Heterogeneity Is Crucial!

Kinds of heterogeneity:
- *ex ante*
  - Newborn consumers differ (e.g., in impatience)
- *ex post*
  - Even ex-ante identical consumers draw idiosyncratic shocks

Key conclusions:
- *Both* kinds of heterogeneity are necessary to match the data
- Models that match $\neq$ have much higher $\kappa$ than Rep Agent
- Less $\neq$ in Europe implies somewhat lower MPCs than U.S.
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The Model: Carroll, Slacalek, and Tokuoka (2013)

**Key Ingredients**

- Uninsurable idiosyncratic income uncertainty
- Permanent and transitory income shocks
  - Permanent shocks boost wealth heterogeneity
  - Transitory shocks increase concavity of C function
- Blanchard (1985) finite lifetimes model
- Modest heterogeneity in impatience
  - Lets the model match wealth distribution
  - In U.S.: $\beta_{\text{most patient}} - \beta_{\text{least impatient}} \approx 0.04$
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Motivation

The Data

Results

Conclusions

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Household Problem

\[ v(m_t) = \max_{\{c_t\}} u(c_t) + \beta \mathbb{E}_t \left[ \psi_{t+1}^{1-\rho} v(m_{t+1}) \right] \]

s.t.
\[
\begin{align*}
  a_t &= m_t - c_t \\
  a_t &\geq 0 \\
  k_{t+1} &= a_t / (\mathbb{D}_t \psi_{t+1}) \\
  m_{t+1} &= (\bar{\ell} + r) k_{t+1} + \xi_{t+1} \\
  r &= \alpha a(K/\bar{L})^{\alpha - 1}
\end{align*}
\]

Variables normalized by permanent labor income \((p_t W)\)

Carroll, Slacalek and Tokuoka
The Distribution of Wealth and the MPC
Both Ex Post and (A Bit of) Ex Ante Heterogeneity

Model of Heterogenous Impatience

- Assume uniformly distributed $\beta$ across households
- Estimate the band $[\hat{\beta} - \nabla, \hat{\beta} + \nabla]$ by minimizing distance between model $(w)$ and data $(\omega)$ net worth held by the top 20, 40, 60, 80%

$$\min_{\{\hat{\beta}, \nabla\}} \sum_{i=20,40,60,80} (w_i - \omega_i)^2,$$

s.t. aggregate net worth–output ratio matches the steady-state value from the perfect foresight model
- Country-by-country estimation
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- Country-by-country estimation
Income Dynamics:

‘Standard’ Process with **Permanent** and Transitory Component

‘Friedman/Buffer Stock’ Income Process

Large literature on US data estimating process:

\[ y_{t+1} = p_{t+1} \xi_{t+1} \]
\[ p_{t+1} = p_t \psi_{t+1} \]

\( p_t = \) permanent income
\( \xi_t = \) transitory income
\( \psi_{t+1} = \) permanent shock
### Income Parameters: US Estimates

- $\sigma_\psi^2 \approx 0.01+$, $\sigma_\xi^2 \approx 0.01+$

<table>
<thead>
<tr>
<th>Authors</th>
<th>Permanent $\sigma_\psi^2$</th>
<th>Transitory $\sigma_\xi^2$</th>
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<tbody>
<tr>
<td><strong>Individual data</strong></td>
<td></td>
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</tr>
<tr>
<td>MaCurdy (1982)‡</td>
<td>0.013</td>
<td>0.031</td>
</tr>
<tr>
<td>Topel (1991)</td>
<td>0.013</td>
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<tr>
<td>Topel and Ward (1992)</td>
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<td>Meghir and Pistaferri (2004)§</td>
<td>0.031</td>
<td>0.032</td>
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<td>Nielsen and Vissing-Jorgensen (2006)¶</td>
<td>0.005</td>
<td>0.015</td>
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<tr>
<td>Krebs, Krishna, and Maloney (2007)¶</td>
<td>$\sim 0.01$</td>
<td>$\sim 0.1$</td>
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<td>Jensen and Shore (2008)¶</td>
<td>0.054</td>
<td>0.171</td>
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<tr>
<td>Guvenen (2009)</td>
<td>0.015</td>
<td>0.061</td>
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<td>Heathcote, Perri, and Violante (2010)*</td>
<td>$0.01-0.03$</td>
<td>$0.05-0.1$</td>
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<td>Hryshko (2010)¶</td>
<td>0.038</td>
<td>0.118</td>
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<td>Low, Meghir, and Pistaferri (2010)</td>
<td>0.011</td>
<td>-</td>
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<tr>
<td>Sabelhaus and Song (2010)§</td>
<td>0.03</td>
<td>0.08</td>
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<tr>
<td>Guvenen, Ozkan, and Song (2012)§</td>
<td>$\sim 0.05$</td>
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<td>Karahan and Ozkan (2012)‡</td>
<td>$\sim 0.013$</td>
<td>$\sim 0.09$</td>
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<tr>
<td>DeBaccker, Graber, and Mogstad (2013) ‡</td>
<td>$\sim 0.015$</td>
<td>$\sim 0.025$</td>
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<td><strong>Household data</strong></td>
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<td>Carroll (1992)</td>
<td>0.016</td>
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<td>Blundell, Pistaferri, and Preston (2008)§</td>
<td>0.010-0.030</td>
<td>0.029-0.055</td>
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<td>Review of Economic Dynamics (2010)☆</td>
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Model Fits U.S. Wealth Distribution Data Remarkably Well

Carroll, Slacalek and Tokuoka

The Distribution of Wealth and the MPC
### Income Parameters: (Limited) Evidence from Europe

- Estimates comparable with US

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<td>0.01–0.096</td>
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<tr>
<td>Albarran, Carrasco, and Martinez-Granado (2009)°</td>
<td>0.015–0.157</td>
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</table>
Other Calibration

Matches the 2010 JEDC volume
Empirical Wealth Distribution Across Countries

Data: Eurosystem Household Finance and Consumption Survey
Memo: Inequality in Net Wealth Driven by Homeownership

The Distribution of Wealth and the MPC

Carroll, Slacalek and Tokuoka
Stylized Facts

Liquid Assets More Concentrated Near Zero—where C Function Steep
## Motivation

The Model

The Data

Results

Conclusions

References

### Model-Implied $\kappa$ Matching Distribution of Net Wealth

- **Aggregate MPC:** $0.1–0.2$
- Almost every country estimated to have less heterogeneity in impatience than in U.S. ($\nabla$ small)

### Table 4 Marginal Propensity to Consume, Matching Distribution of Net Wealth

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Notes: Average (aggregate) propensities in annual terms. Annual MPC is calculated by $\frac{1}{4} - (1 - \text{quarterly MPC}) \frac{1}{4}$. $\hat{\beta}$: Discount factors are uniformly distributed over the interval $[\beta - \nabla, \beta + \nabla]$. 10

Carroll, Slacalek and Tokuoka

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Time preference parameters

| $\beta$ | 0.989 | 0.988 | 0.99 | 0.989 | 0.988 | 0.989 | 0.989 | 0.989 | 0.989 | 0.9 | 0.989 | 0.989 | 0.99 | 0.99 | 0.99 | 0.99 |
| $\nabla$ | 0.003 | 0.005 | 0.002 | 0.003 | 0.005 | 0.002 | 0.003 | 0.003 | 0.001 | 0.003 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | 0.
### Aggregate MPC: 0.2–0.4

- Greater impatience (than for net worth); still less than in U.S.

#### Table 5

**Average (Aggregate) Marginal Propensity to Consume in Annual Terms (matching distribution of liquid financial and retirement assets)**

<table>
<thead>
<tr>
<th>Overall Average</th>
<th>All</th>
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<th>CY</th>
<th>DE</th>
<th>ES</th>
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**Notes:**
- Annual MPC is calculated by \( 1 - (1 - \text{quarterly MPC})^{\frac{1}{4}} \).
- \( \beta \): Discount factors are uniformly distributed over the interval \([\beta - \nu, \beta + \nu]\).
Model-Implied $\kappa$: Matching Distribution of Liquid Assets

- Aggregate MPC: 0.2–0.4
- Greater impatience (than for net worth); still less than in U.S.

### Table 5
Average (Aggregate) Marginal Propensity to Consume in Annual Terms (matching distribution of liquid financial and retirement assets)

<table>
<thead>
<tr>
<th>By wealth/permanent income ratio</th>
<th>AT</th>
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<th>CY</th>
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<tr>
<td>Top 1%</td>
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<tr>
<td>Top 10%</td>
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<td>0.25</td>
<td>0.23</td>
<td>0.25</td>
<td>0.23</td>
<td>0.23</td>
<td>0.43</td>
<td>0.26</td>
<td>0.29</td>
<td>0.32</td>
<td>0.32</td>
<td>0.21</td>
<td>0.17</td>
<td>0.18</td>
<td>0.29</td>
<td>0.27</td>
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<tr>
<td>Unemployed</td>
<td>0.47</td>
<td>0.44</td>
<td>0.47</td>
<td>0.44</td>
<td>0.4</td>
<td>0.63</td>
<td>0.5</td>
<td>0.52</td>
<td>0.61</td>
<td>0.49</td>
<td>0.39</td>
<td>0.29</td>
<td>0.29</td>
<td>0.3</td>
<td>0.55</td>
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Time preference parameters:
- $\beta = 0.969, 0.969, 0.969, 0.969, 0.97, 0.959, 0.969, 0.967, 0.967, 0.966, 0.97, 0.971, 0.971, 0.968, 0.968, 0.97$
- $\gamma = 0.006, 0.006, 0.006, 0.006, 0.005, 0.019, 0.007, 0.008, 0.009, 0.009, 0.005, 0.002, 0.002, 0.008, 0.007, 0.005$
Notes: Figure shows range of aggregate MPCs implied by the distribution of net wealth (lower bound) and of liquid assets (upper bound).
Model Fits Upper Tail Surprisingly Well

- Share of top 10%: \( \frac{\text{model}}{\text{data}} \) mostly \( \sim 1 \), especially for net wealth
Empirical Evidence: $\text{MPC} \sim 0.2-0.6$ ($\gg 0.02-0.04$)

Mostly From US

<table>
<thead>
<tr>
<th>Authors</th>
<th>Consumption Measure</th>
<th>Event/Sample</th>
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<tbody>
<tr>
<td>Blundell, Pistaferri, and Preston (2008)‡</td>
<td>0.05</td>
<td>Estimation Sample: 1980–92</td>
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<td>Browning and Collado (2001)</td>
<td>~ 0</td>
<td>Spanish ECPF Data, 1985–95</td>
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<td>Coronado, Lupton, and Sheiner (2005)</td>
<td>0.36</td>
<td>2003 Tax Cut</td>
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<td>Hausman (2012)</td>
<td>0.6–0.75</td>
<td>1936 Veterans’ Bonus</td>
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<tr>
<td>Hsieh (2003)‡</td>
<td>~ 0</td>
<td>CEX, 1980–2001</td>
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<td>Jappelli and Pistaferri (2013)</td>
<td>0.48</td>
<td>Italy, 2010</td>
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<tr>
<td>Johnson, Parker, and Souleles (2009)</td>
<td>~ 0.25</td>
<td>2003 Child Tax Credit</td>
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<tr>
<td>Lusardi (1996)‡</td>
<td>0.2–0.5</td>
<td>2008 Economic Stimulus Estimation Sample: 1980–87</td>
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<td>Parker, Souleles, Johnson, and McClelland (2011)</td>
<td>0.12–0.30</td>
<td>2008 Economic Stimulus</td>
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<td>Shapiro and Slemrod (2009)</td>
<td>~ 1/3</td>
<td>The Reagan Tax Cuts of the Early 1980s</td>
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<tr>
<td>Souleles (2002)</td>
<td>0.6–0.9</td>
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</table>
Quick Summary So Far

- Modest heterogeneity in impatience captures wealth distribution
- Essential to include low-wealth/high-MPC households in analysis (Rep Agent models can’t do it)
- Models that match wealth distribution boost aggregate MPC: $\sim 0.04 \rightarrow \sim 0.1$–$0.4$ in European countries (cf. up to 0.6 in U.S.)
- **Heterogeneity matters!**
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Wealth Inequality and the MPC

- Inequality implies higher MPC, especially for liquid assets
Empirical Distribution of Liquid Financial Assets vs Theoretical Consumption Functions (for U.S.)

Most impatient (left scale)
Most patient (left scale)

Histogram: empirical density of liquid financial asset + retirement assets (right scale)
Histogram: empirical density of net worth (right scale)
Larger transitory shocks $\Rightarrow$ Bigger $\kappa$

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Low $\sigma^2_\psi$</th>
<th>High $\sigma^2_\psi$</th>
<th>Very High $\sigma^2_\psi$</th>
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<td>0.12</td>
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<tr>
<td>By wealth/permanent income ratio</td>
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<tr>
<td>Top 1%</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
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<tr>
<td>Top 10%</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
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<tr>
<td>Top 20%</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Top 40%</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
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<tr>
<td>Top 50%</td>
<td>0.07</td>
<td>0.07</td>
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<tr>
<td>Top 60%</td>
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<td>0.07</td>
<td>0.08</td>
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<tr>
<td>Bottom 50%</td>
<td>0.17</td>
<td>0.17</td>
<td>0.22</td>
<td>0.26</td>
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<tr>
<td>By income</td>
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</tr>
<tr>
<td>Top 1%</td>
<td>0.09</td>
<td>0.08</td>
<td>0.1</td>
<td>0.11</td>
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<tr>
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<td>0.09</td>
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</tr>
<tr>
<td>Top 20%</td>
<td>0.1</td>
<td>0.1</td>
<td>0.11</td>
<td>0.12</td>
</tr>
<tr>
<td>Top 40%</td>
<td>0.11</td>
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<td>0.12</td>
<td>0.14</td>
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<tr>
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<td>0.12</td>
<td>0.11</td>
<td>0.12</td>
<td>0.14</td>
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<tr>
<td>Top 60%</td>
<td>0.12</td>
<td>0.11</td>
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<tr>
<td>Bottom 50%</td>
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<td>0.13</td>
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<tr>
<td>By employment status</td>
<td></td>
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</tr>
<tr>
<td>Employed</td>
<td>0.11</td>
<td>0.11</td>
<td>0.14</td>
<td>0.16</td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.23</td>
<td>0.24</td>
<td>0.25</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Notes: Annual MPC is calculated by $1 - \left(1 - \text{quarterly MPC}\right)^{4}$. 
‡: Discount factors are uniformly distributed over the interval $[`\beta` - \Delta \beta, `\beta` + \Delta \beta]$. The targeted wealth distribution is the distribution of net wealth in all countries.
Summary

Take-aways

- Aggregate MPC for Net Wealth: 0.1–0.2
- Aggregate MPC for Liquid Assets: 0.2–0.4
- MPC Higher for countries with more wealth inequality
  - MPC in Europe lower than in US (because less ≠)
- MPC much bigger for low-wealth/low-income/unemployed
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