Inequality, Insurance and Family Labor Supply

Celebrating the Life and Work of Gary S. Becker, University of Chicago

Richard Blundell
University College London & Institute for Fiscal Studies

(based on recent research with Luigi Pistaferri and Itay Saporta - extends our 2013 NBER Working Paper.)

October 30-31, 2014
**Introduction**

- Seek to answer the question: **How do families deal with (adverse) labor market shocks?**
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- They are an important input for the design of family tax and transfer systems.

- They also help us understand the links between different measures of inequality and their evolution over the life-cycle.
Begin by noting that inequality has many dimensions:

- Wages $\rightarrow$ earnings $\rightarrow$ joint earnings $\rightarrow$ family income $\rightarrow$ consumption
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- Focus on labor market shocks as the primitive source of uncertainty.

The link between the various measures of inequality is mediated by multiple ‘insurance’ mechanisms, including:

1. Family labor supply, (wages $\rightarrow$ earnings $\rightarrow$ joint earnings)
2. Joint taxation and government transfers, (earnings $\rightarrow$ income)
3. Assets: saving and borrowing, (income $\rightarrow$ consumption expenditures)
4. Informal contracts, gifts, etc.
Questions

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- How should we design policies to best insure these shocks?
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In addition to assets, and to taxes and transfers, we find a key role for family labor supply and document the central importance of nonseparable interactions, (i) between labor supplies within the family and (ii) between labor supplies and consumer expenditure.
QUESTIONS

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- In addition to assets, and to taxes and transfers, we find a key role for family labor supply and document the central importance of nonseparable interactions, (i) between labor supplies within the family and (ii) between labor supplies and consumer expenditure.

- Some consumption inequality descriptives....
Consumption Inequality in the UK
By age and birth cohort
Income Inequality in the UK
By age and birth cohort

Richard Blundell, UCL & IFS

Inequality and Family Labor Supply

October 30-31, 2014
Consumption Inequality in the US
By age and birth cohort
Labour Market Shocks and Consumption

- Focus on consumption, family income and wage dynamics. Why?
  - It is a key way of thinking about the transmission of shocks over the working life and the mechanisms used by families to ‘insure’ against shocks.
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- It provides a coherent framework for studying the evolution of inequality over the working life.
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A important finding is to distinguish between persistent and more transitory shocks to wages/earnings within families and to allow the variances of these shocks to vary with age/time for each birth cohort and education group.
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- For example, detailed work on Norwegian population register panel data....
Life-cycle Income Dynamics

Variance of permanent shocks to male earnings over the life-cycle

Source: Blundell, Graber and Mogstad (2013), Norwegian Population Panel.
Life-cycle Income Dynamics
Norwegian population panel (low skilled)

Variance of Permanent Shocks: Average Cohort Effects LowSkilled

Source: Blundell, Graber and Mogstad (2013).
In this work look at four key ‘insurance’ mechanisms:

1. **Joint labour supply** of each earner, through a measure of the employment and hours of family members.
2. **Non-linear joint taxes and government transfers.**
3. **Self-insurance** (i.e., savings) through a *direct* measure of assets.
4. **Other** (un-modeled) mechanisms - and check for advance information.

Here I’ll briefly present some recent results with new PSID data:

- More comprehensive consumption measures - over 70% of the budget.
- Asset data collected in every wave - housing, financial, mortgage and other debt.
- Sample: couples with head aged 27-59.

The empirical results allow for non-separabilities in family labor supply and consumption, heterogeneous assets, correlated shocks to individual wages in families.
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### Descriptive Statistics for Consumption

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>28,178</td>
<td>31,215</td>
<td>32,841</td>
<td>36,783</td>
<td>37,870</td>
<td>33,934</td>
</tr>
<tr>
<td>Non durable Cons.</td>
<td>6,859</td>
<td>7,409</td>
<td>7,092</td>
<td>7,656</td>
<td>7,996</td>
<td>7,000</td>
</tr>
<tr>
<td>Food at home</td>
<td>5,471</td>
<td>5,476</td>
<td>5,356</td>
<td>5,412</td>
<td>5,327</td>
<td>5,023</td>
</tr>
<tr>
<td>Gasoline</td>
<td>1,387</td>
<td>1,932</td>
<td>1,736</td>
<td>2,244</td>
<td>2,669</td>
<td>1,977</td>
</tr>
<tr>
<td>Services</td>
<td>21,319</td>
<td>23,806</td>
<td>25,749</td>
<td>29,127</td>
<td>29,874</td>
<td>26,933</td>
</tr>
<tr>
<td>Food out</td>
<td>2,029</td>
<td>2,157</td>
<td>2,158</td>
<td>2,228</td>
<td>2,177</td>
<td>1,887</td>
</tr>
<tr>
<td>Health ins.</td>
<td>1,056</td>
<td>1,200</td>
<td>1,324</td>
<td>1,510</td>
<td>1,549</td>
<td>1,656</td>
</tr>
<tr>
<td>Health serv.</td>
<td>902</td>
<td>1,073</td>
<td>1,209</td>
<td>1,249</td>
<td>1,306</td>
<td>1,396</td>
</tr>
<tr>
<td>Utilities</td>
<td>2,282</td>
<td>2,509</td>
<td>2,448</td>
<td>4,017</td>
<td>4,073</td>
<td>4,240</td>
</tr>
<tr>
<td>Transportation</td>
<td>3,122</td>
<td>3,557</td>
<td>4,054</td>
<td>3,276</td>
<td>3,210</td>
<td>2,846</td>
</tr>
<tr>
<td>Education</td>
<td>1,946</td>
<td>2,161</td>
<td>2,165</td>
<td>2,206</td>
<td>2,206</td>
<td>1,956</td>
</tr>
<tr>
<td>Child care</td>
<td>601</td>
<td>618</td>
<td>598</td>
<td>595</td>
<td>524</td>
<td>593</td>
</tr>
<tr>
<td>Home ins.</td>
<td>430</td>
<td>454</td>
<td>500</td>
<td>543</td>
<td>580</td>
<td>552</td>
</tr>
<tr>
<td>Rent (or rent eq.)</td>
<td>8,950</td>
<td>9,906</td>
<td>11,293</td>
<td>13,504</td>
<td>14,249</td>
<td>11,807</td>
</tr>
<tr>
<td>Observations</td>
<td>1,872</td>
<td>1,951</td>
<td>1,984</td>
<td>2,011</td>
<td>2,115</td>
<td>2,221</td>
</tr>
</tbody>
</table>

# Descriptive Statistics for Assets and Earnings

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets</td>
<td>332,625</td>
<td>333,428</td>
<td>346,658</td>
<td>411,276</td>
<td>449,504</td>
<td>383,702</td>
</tr>
<tr>
<td>Housing and RE assets</td>
<td>159,856</td>
<td>177,927</td>
<td>205,878</td>
<td>244,986</td>
<td>264,971</td>
<td>221,754</td>
</tr>
<tr>
<td>Financial assets</td>
<td>173,026</td>
<td>155,775</td>
<td>140,987</td>
<td>166,534</td>
<td>184,996</td>
<td>162,347</td>
</tr>
<tr>
<td>Total debt</td>
<td>72,718</td>
<td>78,382</td>
<td>89,319</td>
<td>99,986</td>
<td>106,173</td>
<td>103,982</td>
</tr>
<tr>
<td>Mortgage</td>
<td>65,876</td>
<td>70,319</td>
<td>81,167</td>
<td>91,831</td>
<td>97,293</td>
<td>93,365</td>
</tr>
<tr>
<td>Other debt</td>
<td>7,021</td>
<td>8,223</td>
<td>8,351</td>
<td>8,408</td>
<td>9,366</td>
<td>11,024</td>
</tr>
<tr>
<td>First earner (head)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings</td>
<td>54,220</td>
<td>57,979</td>
<td>57,692</td>
<td>59,108</td>
<td>58,856</td>
<td>57,226</td>
</tr>
<tr>
<td>Hours worked</td>
<td>2,357</td>
<td>2,317</td>
<td>2,309</td>
<td>2,309</td>
<td>2,284</td>
<td>2,140</td>
</tr>
<tr>
<td>Second earner (wife)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation rate</td>
<td>0.81</td>
<td>0.8</td>
<td>0.81</td>
<td>0.81</td>
<td>0.81</td>
<td>0.8</td>
</tr>
<tr>
<td>Earnings (cond. on part.)</td>
<td>26,035</td>
<td>27,082</td>
<td>28,716</td>
<td>29,327</td>
<td>29,257</td>
<td>30,262</td>
</tr>
<tr>
<td>Hours worked (cond. on part.)</td>
<td>1,666</td>
<td>1,691</td>
<td>1,697</td>
<td>1,707</td>
<td>1,659</td>
<td>1,648</td>
</tr>
<tr>
<td>Observations</td>
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<td>1,951</td>
<td>1,984</td>
<td>2,011</td>
<td>2,115</td>
<td>2,221</td>
</tr>
</tbody>
</table>

Wage Process

For earner $j = \{1, 2\}$ in household $i$, period $t$, wage growth is:

$$
\Delta \log W_{i,j,t} = \Delta X'_{i,j,t} \beta_j + \Delta u_{i,j,t} + v_{i,j,t}
$$
For earner \( j = \{1, 2\} \) in household \( i \), period \( t \), wage growth is:

\[
\Delta \log W_{ij,t} = \Delta X'_{ij,t} \beta_j + \Delta u_{ij,t} + v_{ij,t}
\]

\[
\begin{pmatrix}
  u_{i,1,t} \\
  u_{i,2,t} \\
  v_{i,1,t} \\
  v_{i,2,t}
\end{pmatrix}
\sim i.i.d.
\begin{pmatrix}
  0 \\
  0 \\
  0 \\
  0
\end{pmatrix},
\begin{pmatrix}
  \sigma_{u,1}^2 & \sigma_{u,1,u2} & 0 & 0 \\
  \sigma_{u,1,u2} & \sigma_{u,2}^2 & 0 & 0 \\
  0 & 0 & \sigma_{v,1}^2 & \sigma_{v,1,v2} \\
  0 & 0 & \sigma_{v,1,v2} & \sigma_{v,2}^2
\end{pmatrix}
\]
For earner $j = \{1, 2\}$ in household $i$, period $t$, wage growth is:

$$\Delta \log W_{i,j,t} = \Delta X'_{i,j,t} \beta_j + \Delta u_{i,j,t} + v_{i,j,t}$$

$$\begin{pmatrix} u_{i,1,t} \\ u_{i,2,t} \\ v_{i,1,t} \\ v_{i,2,t} \end{pmatrix} \sim i.i.d. \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_{u,1} & \sigma_{u,1,u_2} & 0 & 0 \\ \sigma_{u,1,u_2} & \sigma^2_{u,2} & 0 & 0 \\ 0 & 0 & \sigma^2_{v,1} & \sigma_{v,1,v_2} \\ 0 & 0 & \sigma_{v,1,v_2} & \sigma^2_{v,2} \end{pmatrix}$$

- Allow the variances to differ by across the life-cycle, by education group and across the business cycle.
- Correlated across family members - assortative matching and/or insurance?
Wage Parameters Estimates

Baseline: Young, College Educated

<table>
<thead>
<tr>
<th>Sample</th>
<th>Trans.</th>
<th>Perm.</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>$\sigma_{u1}^2$</td>
<td>$\sigma_{v1}^2$</td>
<td>0.033 (0.007)</td>
</tr>
<tr>
<td>Females</td>
<td>$\sigma_{u2}^2$</td>
<td>$\sigma_{v2}^2$</td>
<td>0.012 (0.006)</td>
</tr>
<tr>
<td>Covariance of shocks</td>
<td>Trans. $\sigma_{u1,u2}$</td>
<td>Perm. $\sigma_{v1,v2}$</td>
<td>0.0049 (0.0027)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.0042 (0.0020)</td>
</tr>
<tr>
<td>Observations</td>
<td></td>
<td></td>
<td>8,191</td>
</tr>
</tbody>
</table>
Household Optimization

- Household chooses consumption expenditures and hours allocations over the lifetime subject to a (pooled) intertemporal budget constraint:
**Household Optimization**

- Household chooses consumption expenditures and hours allocations over the lifetime subject to a (pooled) intertemporal budget constraint:

- **Time allocations: nonseparabilities in family labor supply**
  
  ▶ Allow labor supplies to be (Frisch) complements or substitutes.
  
  ▶ Allow this to change with presence and age of children.
  
  ▶ Even if Frisch complements, can still provide insurance - Marshallian substitutes.
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- **Consumption allocations: nonseparability with labor supplies**
  - Allow complements and substitutes.
  - Can differ according to the extensive (employment) and intensive (hours) margin.
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- **Consumption allocations: nonseparability with labor supplies**
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  - Can differ according to the extensive (employment) and intensive (hours) margin.

- **Empirical approach:** Relate expenditure changes and hours changes to permanent \((v_{j,t})\) and transitory \((u_{j,t})\) wage shocks within the family.
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\sim
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_1} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]
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\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
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\[\kappa_{h_j,u_j} = \eta_{h_j,w_j} \rightarrow [\text{Frisch}]\]
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\end{pmatrix} 
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

\[\kappa_{h_j,u_j} = \eta_{h_j,\omega_j} \rightarrow [\text{Frisch}] \quad \kappa_{h_j,v_j} \rightarrow [\text{Marshall}]\]
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\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix} \sim \begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix} \begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

\[\kappa_{h_j,u_j} = \eta_{h_j,\omega_j} \rightarrow \text{[Frisch]} \quad \kappa_{h_j,v_j} \rightarrow \text{[Marshall]} \quad \kappa_{h_j,v_{-j}} \rightarrow \text{[AWE]}\]
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\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
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\]

\[
\kappa_{c,v_j} = (1 - \pi_{i,t}) s_{i,j,t} \frac{\eta_{c,p} \left( 1 + \eta_{h_j,w_j} \right)}{\eta_{c,p} + \frac{1}{(1 - \pi_{i,t}) \eta_{h,w}}}
\]
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\sim
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

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\]

\[
\kappa_{c,v_j} = (1 - \pi_{i,t}) s_{i,j,t} \frac{\eta_{c,p} \left(1 + \eta_{h_j,w_j}\right)}{\eta_{c,p} + (1 - \pi_{i,t}) \eta_{h,w}}
\]

\[
\pi_{i,t} \approx \frac{\text{Assets}_{i,t}}{\text{Assets}_{i,t} + \text{Human Wealth}_{i,t}}
\]
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\approx
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

\[\kappa_{h_j,u_j} = \eta_{h_j,w_j} \rightarrow \text{[Frisch]} \quad \kappa_{h_j,v_j} \rightarrow \text{[Marshall]} \quad \kappa_{h_j,v_j} \rightarrow \text{[AWE]}\]

\[\kappa_{c,v_j} = \left(1 - \pi_{i,t}\right) s_{i,j,t} \frac{\eta_{c,p} \left(1 + \eta_{h_j,w_j}\right)}{\eta_{c,p} + \left(1 - \pi_{i,t}\right) \eta_{h,w}}\]

\[s_{i,j,t} \approx \frac{\text{Human Wealth}_{i,j,t}}{\text{Human Wealth}_{i,t}}\]
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\simeq
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

\[\kappa_{h_j,u_j} = \eta_{h_j,w_j} \rightarrow \text{[Frisch]} \quad \kappa_{h_j,v_j} \rightarrow \text{[Marshall]} \quad \kappa_{h_j,v_{-j}} \rightarrow \text{[AWE]}\]

\[\kappa_{c,v_j} = \left(1 - \pi_{i,t}\right)s_{i,j,t} \frac{\eta_{c,p} \left(1 + \eta_{h_j,w_j}\right)}{\eta_{c,p} + \eta_{h,w} (1 - \pi_{i,t})} \]

\[\eta_{c,p} \rightarrow \text{Consumption EIS}\]
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\sim
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

\[
\kappa_{h_j,u_j} = \eta_{h_j,w_j} \rightarrow [\text{Frisch}] \quad \kappa_{h_j,v_j} \rightarrow [\text{Marshall}] \quad \kappa_{h_j,v_{-j}} \rightarrow [\text{AWE}]
\]

\[
\kappa_{c,v_j} = (1 - \pi_{i,t}) s_{i,j,t} \frac{\eta_{c,p} \left(1 + \eta_{h_j,w_j}\right)}{\eta_{c,p} + \left(1 - \pi_{i,t}\right) \eta_{h,w}}
\]

\[
\overline{\eta}_{h,w} = s_{i,j,t} \eta_{h_j,w_j} + s_{i,-j,t} \eta_{h_{-j},w_{-j}}
\]
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\sim
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

\[
\kappa_{h_j,u_j} = \eta_{h_j,w_j} \rightarrow [\text{Frisch}] \quad \kappa_{h_j,v_j} \rightarrow [\text{Marshall}] \quad \kappa_{h_j,v_{-j}} \rightarrow [\text{AWE}]
\]

\[
\kappa_{c,v_j} = (1 - \beta) (1 - \pi_{i,t}) s_{ij,t} \frac{\eta_{c,p} \left( 1 + \eta_{h_j,w_j} \right)}{\eta_{c,p} + (1 - \beta) (1 - \pi_{i,t}) \eta_{h,w}}
\]
Illustration: family consumption and hours growth under separability

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix}
\sim
\begin{pmatrix}
\kappa_{h_1,u_1} & 0 & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
0 & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
0 & 0 & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
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\]

\[
\beta \rightarrow \text{External insurance (networks, etc.)}
\]
When preferences are non-separable:

\[
\begin{pmatrix}
\Delta h_{1,t} \\
\Delta h_{2,t} \\
\Delta c_t
\end{pmatrix} \sim
\begin{pmatrix}
\kappa_{h_1,u_1} & \kappa_{h_1,u_2} & \kappa_{h_1,v_1} & \kappa_{h_1,v_2} \\
\kappa_{h_2,u_1} & \kappa_{h_2,u_2} & \kappa_{h_2,v_1} & \kappa_{h_2,v_2} \\
\kappa_{c,u_1} & \kappa_{c,u_2} & \kappa_{c,v_1} & \kappa_{c,v_2}
\end{pmatrix}
\begin{pmatrix}
\Delta u_{1,t} \\
\Delta u_{2,t} \\
v_{1,t} \\
v_{2,t}
\end{pmatrix}
\]

- $\kappa_{c,u_j} \rightarrow$ non-separability between consumption and labor supply of member $j$
- $\kappa_{h_j,u_{-j}} \rightarrow$ non-separability between spouses’ labor supplies.

- Nonlinear functions of the ‘structural’ parameters which determine the Frisch and Marshallian elasticities etc.
- Parameters vary with characteristics.
- Joint taxation and government transfers provide further key interactions, see http://www.ucl.ac.uk/~uctp39a/
Note that $\beta$ is not identified separately from $\pi$

Back out $\pi$ from the data and estimate $\beta$

$\pi_{i,t} \approx \frac{\text{Assets}_{i,t}}{\text{Human Wealth}_{i,t} + \text{Assets}_{i,t}}$

*Observed in PSID*

*Projected lifetime earnings*
\[ S_{i,t} \approx \frac{\text{Human Wealth}_{\text{male},i,t}}{\text{Human Wealth}_{i,t}} \]
DISTRIBUTION OF $s$ BY AGE

\[ s_{i,t} \approx \frac{\text{Human Wealth}_{i,t}^{\text{male}}}{{\text{Human Wealth}}_{i,t}} \]

The Distribution of $S$ by Age of Household Head

- 95th perc.
- 90th perc.
- 75th perc.
- 50th perc.
- 25th perc.
- 10th perc.
- 5th perc.
Distribution of $\pi$ by Age

$$\pi_{i,t} \approx \frac{\text{Assets}_{i,t}}{\text{Assets}_{i,t} + \text{Human Wealth}_{i,t}}$$
**Distribution of \( \pi \) by Age**

\[
\pi_{i,t} \approx \frac{\text{Assets}_{i,t}}{\text{Assets}_{i,t} + \text{Human Wealth}_{i,t}}
\]

The Distribution of Pi and Assets by Age of Household Head

- **Pi (5th to 95th Percentiles) - Left axis**
- **Total Assets (Median, Thousands of Dollars) - Right axis**
Results: Intensive family labour supply, youngest child \( > 5 \).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Additive separab.</th>
<th>Non-separable 1</th>
<th>Non-separable 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-insur.</td>
<td>( E(\pi) ) 0.18</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>Male weight</td>
<td>( E(s) ) 0.69</td>
<td>0.69</td>
<td>0.69</td>
</tr>
<tr>
<td>Outside insur.</td>
<td>( \beta ) -.-</td>
<td>(-0.100) (0.298)</td>
<td>0</td>
</tr>
<tr>
<td>Cons. EIS</td>
<td>( \eta_{c,p} ) 0.201 (0.077)</td>
<td>0.437 (0.124)</td>
<td>0.448 (0.126)</td>
</tr>
<tr>
<td>Male Frisch</td>
<td>( \eta_{h1,w1} ) 0.431 (0.097)</td>
<td>0.514 (0.150)</td>
<td>0.497 (0.150)</td>
</tr>
<tr>
<td>Female Frisch</td>
<td>( \eta_{h2,w2} ) 0.831 (0.133)</td>
<td>1.032 (0.265)</td>
<td>1.041 (0.275)</td>
</tr>
<tr>
<td>NS cons/leis(_1)</td>
<td>( \eta_{c,w1} ) -.-</td>
<td>(-0.141) (0.051)</td>
<td>(-0.141) (0.053)</td>
</tr>
<tr>
<td></td>
<td>( \eta_{h1,p} ) -.-</td>
<td>0.082 (0.030)</td>
<td>0.082 (0.031)</td>
</tr>
<tr>
<td>NS cons/leis(_2)</td>
<td>( \eta_{c,w2} ) -.-</td>
<td>(-0.138) (0.139)</td>
<td>(-0.158) (0.121)</td>
</tr>
<tr>
<td></td>
<td>( \eta_{h2,p} ) -.-</td>
<td>0.162 (0.166)</td>
<td>0.185 (0.145)</td>
</tr>
<tr>
<td>NS leis(_1)/leis(_2)</td>
<td>( \eta_{h1,w2} ) -.-</td>
<td>0.128 (0.052)</td>
<td>0.120 (0.064)</td>
</tr>
<tr>
<td></td>
<td>( \eta_{h2,w1} ) -.-</td>
<td>0.258 (0.103)</td>
<td>0.242 (0.119)</td>
</tr>
</tbody>
</table>

P-value zero restr. 1.1%
Implications

- Male and female non-market time in couples are sometimes Frisch complements,
  - reversed (always substitutes) for families with young children,
  - even as complements, family labor supply can (and does!) still provide insurance.
  - the key is to note the Marshallian labor supply responses - Marshallian substitutes but Frisch complements.
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- Some consumption goods are Frisch complements to non-market time and some are Frisch substitutes,
  - food-out, childcare, transport and utilities, are good examples,
  - these patterns of interactions also differ between the extensive (employment) and intensive (hours) margin,
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- These underlying hours and consumption interactions are key to understanding how families insure shocks......
**Marshallian Elasticities: By Age**

![Graph showing Marshallian Elasticities by age]

- **Wife's Marshallian Elasticity**
- **Head's Marshallian Elasticity**
Marshallian Elasticities: By Age

Wife's Marshallian Elasticity ($\kappa_{12}$)

Age of household head

95th perc.
90th perc.
75th perc.
50th perc.
25th perc.
10th perc.
5th perc.
**Marshallian Elasticities: By Age**

![Graph showing head's Marshallian Elasticity (κ₇) by age. The graph plots the percentage change in the price of a good, represented by the y-axis, against the age of the household head, represented on the x-axis. The graph includes lines for different percentiles, indicating the estimated elasticities at various age groups.](image-url)
INSURANCE VIA LABOR SUPPLY (10% DECREASE IN MALE WAGE): BY AGE

All

Age of household head

No taxes, fixed labor and no insurance (s)
with taxes, fixed labor and no insurance
with family labor supply adjustment
with family labor supply adjustment and other insurance
INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES): BY AGE

Response of Consumption to a 10% Permanent Decrease in the Male’s Wage Rate

-7 -6 -5 -4 -3 -2 0 1 2 3 4 5 6 7

Age of household head

30-34 35-39 40-44 45-49 50-54 55-59 60-65

- fixed labor supply and no insurance
- with family labor supply adjustment
- with family labor supply adjustment and other insurance
INSURANCE VIA LABOR SUPPLY

Consumption Response to a -10% Permanent Shock to Head's Wages ($\kappa_3$)
Insurance via Labor Supply (Shock to Male Wages): By Age, Food Stamps Eligible

Food Stamps Eligible at t-2

- -3
- -2
- -1
- 0
- 1
- 2
Age of household head

35 40 45 50 55

- No taxes, fixed labor and no insurance (s)
- With taxes, fixed labor and no insurance
- With family labor supply adjustment
- With family labor supply adjustment and other insurance
The average response of total earnings to a permanent shock to the female’s wages:

\[
\frac{\partial \Delta y}{\partial v_2} = s \times \frac{\partial \Delta y_1}{\partial v_2} + (1 - s) \times \frac{\partial \Delta y_2}{\partial v_2} = 0.25
\]

\[
\kappa_{y_1, v_2} = -0.23 \quad \kappa_{y_2, v_2} = 1.32
\]

Response of consumption to a 10% permanent decrease in the female’s wage rate \((v_2 = -0.1):\)

- two earners, fixed labor supply and no insurance \(-3.1\%\)
- with family labor supply adjustment \(-2.5\%\)
- with family labor supply adjustment and other insurance \(-2.1\%)
PUTTING THE PIECES TOGETHER...

- Document the importance of different ‘insurance’ mechanisms:
  - Family labor supply; Assets; Joint Taxation and Welfare; etc.
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- Found essential non-separability between family labor supplies and between consumption and labour supply,
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- Thanks Gary, for those wonderful insights - for everything!
CROSS-MARSHALLIAN ELASTICITIES: BY AGE

Before-Tax Cross Marshallian Elasticities

- Age of household head
- Male Hours to Female Wages
- Female Hours to Male Wages
Insurance via Labor Supply (Shock to Male Wages): By Age

Consumption Response to a -10% Permanent Shock to Head's Wages (κ₃)

Age of household head

5th perc.
10th perc.
25th perc.
50th perc.
75th perc.
90th perc.
95th perc.

30-34 35-39 40-44 45-49 50-54 55-59 60-65
**INTERPRETATION: INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES)**

The average response of total earnings \((y = y_1 + y_2)\) to a permanent shock to the male’s wages:

\[
\frac{\partial \Delta y}{\partial v_1} = s \cdot \frac{\partial \Delta y_1}{\partial v_1} + (1 - s) \cdot \frac{\partial \Delta y_2}{\partial v_1} = 0.44
\]

\(s = 0.69\)
\(\hat{\kappa}_{y_1,v_1} = 0.98\)
\(\hat{\kappa}_{y_2,v_1} = 0.81\)
**INTERPRETATION: INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES)**

The average response of total earnings \((y = y_1 + y_2)\) to a permanent shock to the male’s wages:

\[
\frac{\partial \Delta y}{\partial v_1} = s \left( \hat{s} = 0.69 \right) \cdot \frac{\partial \Delta y_1}{\partial v_1} + (1 - s) \left( \hat{\kappa}_{y_1,v_1} = 0.98, \hat{s} = 0.31 \right) \cdot \frac{\partial \Delta y_2}{\partial v_1} = 0.44
\]

Response of consumption to a 10% permanent decrease in the male’s wage rate \((v_1 = -0.1)\):

- one earner, fixed labor supply and no insurance: -10%
**INTERPRETATION: INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES)**

The average response of total earnings \((y = y_1 + y_2)\) to a permanent shock to the male’s wages:

\[
\frac{\partial \Delta y}{\partial \Delta v_1} = \hat{s} \cdot \frac{\partial \Delta y_1}{\partial \Delta v_1} + (1 - \hat{s}) \cdot \frac{\partial \Delta y_2}{\partial \Delta v_1} = 0.44
\]

Response of consumption to a 10% permanent decrease in the male’s wage rate \((v_1 = -0.1)\):

- one earner, fixed labor supply and no insurance \(-10\%\)
- two earners, fixed labor supply and no insurance \(-6.9\%\)
INTERPRETATION: INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES)

The average response of total earnings \((y = y_1 + y_2)\) to a permanent shock to the male’s wages:

\[
\frac{\partial \Delta y}{\partial v_1} = s \left( \frac{\partial \Delta y_1}{\partial v_1} \right) + (1 - s) \left( \frac{\partial \Delta y_2}{\partial v_1} \right) = 0.44
\]

\[
\hat{s} = 0.69, \quad \hat{\kappa}_{y_1,v_1} = 0.98, \quad 1 - \hat{s} = 0.31, \quad \hat{\kappa}_{y_2,v_1} = -0.81
\]

Response of consumption to a 10% permanent decrease in the male’s wage rate \((v_1 = -0.1)\):

- one earner, fixed labor supply and no insurance: -10%
- two earners, fixed labor supply and no insurance: -6.9%
- with husband labor supply adjustment: -6.8%
INTERPRETATION: INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES)

The average response of total earnings \( y = y_1 + y_2 \) to a permanent shock to the male’s wages:

\[
\frac{\partial \Delta y}{\partial \nu_1} = s \frac{\partial \Delta y_1}{\partial \nu_1} + (1-s) \frac{\partial \Delta y_2}{\partial \nu_1}
\]

\( \hat{s} = 0.69 \), \( \hat{\kappa}_{y_1,\nu_1} = 0.98 \), \( \hat{\kappa}_{y_2,\nu_1} = -0.81 \)

\[= 0.44\]

Response of consumption to a 10% permanent decrease in the male’s wage rate \( (\nu_1 = -0.1) \):

- one earner, fixed labor supply and no insurance -10%
- two earners, fixed labor supply and no insurance -6.9%
- with husband labor supply adjustment -6.8%
- with family labor supply adjustment -4.4%
INTERPRETATION: INSURANCE VIA LABOR SUPPLY (SHOCK TO MALE WAGES)

The average response of total earnings \( (y = y_1 + y_2) \) to a permanent shock to the male’s wages:

\[
\frac{\partial \Delta y}{\partial v_1} = s \frac{\partial \Delta y_1}{\partial v_1} + (1 - s) \frac{\partial \Delta y_2}{\partial v_1} = 0.44
\]

\( \hat{s} = 0.69 \)
\( \hat{\kappa}_{y_1,v_1} = 0.98 \)
\( \hat{\kappa}_{y_2,v_1} = -0.81 \)

Response of consumption to a 10% permanent decrease in the male’s wage rate \( (v_1 = -0.1) \):

- one earner, fixed labor supply and no insurance: -10%
- two earners, fixed labor supply and no insurance: -6.9%
- with husband labor supply adjustment: -6.8%
- with family labor supply adjustment: -4.4%
- with family labor supply adjustment and other insurance: -3.8%