Motivations

- Americans work more than Europeans
  - This was not the case forty years ago
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  • High taxes lead to reduction in market hours
  • Correlation between changes in hours worked and changes in tax levels
  • Implicit conclusion: labour supply elasticity is high
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- **Micro vs macro elasticities**
  - Large vs small variations (Chetty 2009)
  - Short-term vs long-term elasticities
  - Extensive vs intensive elasticity (Rogerson and Wallenius 2009)
Extensive vs Intensive Margins

- **Microeconometric studies**
Extensive vs Intensive Margins

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- **Public economics**
  - Labour earnings tax design

- This paper makes three contributions:
Extensive vs Intensive Margins

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  1. develop consistent micro-data for an aggregation analysis of three key countries - the US, the UK and France - over the past 30 years
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Extensive vs Intensive Margins

• **Microeconometric studies**
  • Older workers: Gruber and Wise (2004)

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• This paper makes three contributions:
  1. develop consistent micro-data for an aggregation analysis of three key countries - the US, the UK and France - over the past 30 years
  2. provide a detailed decomposition of the evolution of total hours of work into changes at the extensive and intensive margin
  3. provide a first attempt at consistently estimating micro and macro elasticities on UK data
Data

• **Labour Force surveys**
  • FR: Enquête Emploi 1968-2008
Data

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Data

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  - Annual vs continuous surveys
  - Usual vs actual hours
Data

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  - Intensive: number of actual hours worked divided by the extensive margin

- **Measurement issues**
  - Annual vs continuous surveys
  - Usual vs actual hours

- **Our estimation**
  - Extensive: employment rate from the reference week
  - Intensive: actual hours from the reference week in continuous surveys; usual hours adjusted for annual surveys for France; actual hours adjusted for UK and US for annual surveys
Figure 1: Mean annual hours per individual aged 16 to 74
Figure 2: Employment rate (per population) aged 16 to 74
Figure 3: Mean annual hours per worker aged 16 to 74
Figure 4: Male total hours by age 1977
Total hours by age

Figure 5: Male total hours by age 2007

[Graph showing male total hours by age for FR, UK, and US]
Figure 6: Male employment by age 1977
Figure 7: Male employment by age 2007
Total hours by age

Figure 8: Female total hours by age 1977
Total hours by age

Figure 9: Female total hours by age 2007
Employment by age

Figure 10: Female employment by age 1977
Figure 11: Female employment by age 2007
## Variations within the year

**Table 1: Weekly hours and weeks worked (2007)**

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FR</td>
<td>UK</td>
</tr>
<tr>
<td><strong>Annual hours (all)</strong></td>
<td>1800</td>
<td>1919</td>
</tr>
<tr>
<td><strong>Share part-time</strong></td>
<td>5.0%</td>
<td>10.5%</td>
</tr>
</tbody>
</table>

### Full-time workers

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual hours</strong></td>
<td>1839</td>
<td>2044</td>
<td>2229</td>
<td>1631</td>
<td>1777</td>
<td>2041</td>
</tr>
<tr>
<td><strong>Weekly hours</strong></td>
<td>42.1</td>
<td>46.8</td>
<td>44.6</td>
<td>39.0</td>
<td>43.5</td>
<td>42.0</td>
</tr>
<tr>
<td><strong>Weeks worked</strong></td>
<td>43.7</td>
<td>43.7</td>
<td>50.0</td>
<td>41.8</td>
<td>40.9</td>
<td>48.5</td>
</tr>
</tbody>
</table>

### Part-time workers

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual hours</strong></td>
<td>995</td>
<td>857</td>
<td>1030</td>
<td>1008</td>
<td>851</td>
<td>1021</td>
</tr>
<tr>
<td><strong>Weekly hours</strong></td>
<td>22.5</td>
<td>22.2</td>
<td>21.3</td>
<td>23.7</td>
<td>22.9</td>
<td>21.5</td>
</tr>
<tr>
<td><strong>Weeks worked</strong></td>
<td>44.2</td>
<td>38.6</td>
<td>48.4</td>
<td>42.5</td>
<td>37.1</td>
<td>47.5</td>
</tr>
</tbody>
</table>
Variations within the year

Figure 12: Actual weekly hours by month of the year (2002-2008)
Decomposing Changes in Hours

• Suppose there are \( j = 1, \ldots, J \) broad types
Decomposing Changes in Hours

• Suppose there are \( j = 1, \ldots, J \) broad types

• \( H_t \) is computed in any year \( t \) as an average of hours \( H_{jt} \) with weights equal to the population shares \( q_{jt} \)

\[
H_t = \sum_{j=1}^{J} q_{jt} H_{jt}
\]
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- \( H_t \) is computed in any year \( t \) as an average of hours \( H_{jt} \) with weights equal to the population shares \( q_{jt} \)

\[
H_t = \sum_{j=1}^{J} q_{jt} H_{jt}
\]

- where each \( H_{jt} \) can be expressed as the product of hours per worker \( h_{jt} \) and participation in the labour market \( p_{jt} \)

\[
H_{jt} = p_{jt} h_{jt}.
\]
Decomposing Changes in Hours

- We measure the change due to the behavior of category $j$, holding the population structure constant as in date $t - 1$, as in a Laspeyres index

$$\Delta_{jt} = a_{j,t-1}[H_{jt} - H_{j,t-1}].$$
Decomposing Changes in Hours

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$$\Delta_{jt} = a_{j,t-1}[H_{jt} - H_{j,t-1}].$$

• The total change across all $J$ categories of workers is then

$$\Delta_t = \sum_{j=1}^{J} \Delta_{jt}$$
Decomposing Changes in Hours

- We measure the change due to the behavior of category $j$, holding the population structure constant as in date $t - 1$, as in a Laspeyres index

$$\Delta_{jt} = q_{j,t-1}[H_{jt} - H_{j,t-1}].$$

- The total change across all $J$ categories of workers is then

$$\Delta_t = \sum_{j=1}^{J} \Delta_{jt}$$

- and, by construction, we have

$$H_t - H_{t-1} = S_t + \Delta_t$$
Decomposing Changes in Hours

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\[
\Delta_t = \sum_{j=1}^{J} \Delta_{jt}
\]

- and, by construction, we have

\[
H_t - H_{t-1} = S_t + \Delta_t
\]

- where \( S_t \) measures the change in the composition of the population:

\[
S_t = \sum_{j=1}^{J} H_{jt} [q_{jt} - q_{j,t-1}].
\]
Table 2: Decomposing the change in total hours, 1977-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Youth (16-29)</th>
<th>Prime aged (30-54)</th>
<th>Old (55-74)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>FR 1977</td>
<td>1402</td>
<td>871</td>
<td>2010</td>
</tr>
<tr>
<td>2007</td>
<td>858</td>
<td>627</td>
<td>1639</td>
</tr>
<tr>
<td>$\Delta_j$</td>
<td>-82</td>
<td>-38</td>
<td>-82</td>
</tr>
<tr>
<td>UK 1977</td>
<td>1707</td>
<td>938</td>
<td>2117</td>
</tr>
<tr>
<td>2007</td>
<td>1219</td>
<td>876</td>
<td>1786</td>
</tr>
<tr>
<td>$\Delta_j$</td>
<td>-71</td>
<td>-9</td>
<td>-70</td>
</tr>
<tr>
<td>US 1977</td>
<td>1344</td>
<td>835</td>
<td>2018</td>
</tr>
<tr>
<td>2007</td>
<td>1236</td>
<td>956</td>
<td>1922</td>
</tr>
<tr>
<td>$\Delta_j$</td>
<td>-19</td>
<td>22</td>
<td>-19</td>
</tr>
</tbody>
</table>


- evolution of total $\Delta$ differs: -195 for FR, -118 for UK, +165 for US.
## Table 2: Decomposing the change in total hours, 1977-2007

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<th>Year</th>
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</tr>
<tr>
<td>$\Delta_j$</td>
<td>-19</td>
<td>22</td>
<td>-19</td>
</tr>
</tbody>
</table>


- evolution of total $\Delta$ differs: -195 for FR, -118 for UK, +165 for US.
- composition $S$: +10 for FR, +25 for UK, +46 for US
Figure 13: Decomposing the change in total hours (1977-2007)
• We decompose the change in total hours for the $j$ type $\Delta_j$ into:
  - an intensive component $l_j = p_{ij} \Delta h_j$
  - an extensive component $E_j = h_{Ej} \Delta p_j$

\[ \Delta_{jt} = l_j + E_j \]
Intensive vs extensive margins

• We decompose the change in total hours for the \( j \) type \( \Delta_j \) into:
  – an intensive component \( I_j = p_{lj} \Delta h_j \)
  – an extensive component \( E_j = h_{Ej} \Delta p_j \)

\[
\Delta_{jt} = I_j + E_j
\]

• We get intensive bounds
  • Assuming \( p_{lj} \in [p_{j,t-1}, p_{jt}] \)
    \[
l_j \in [p_{j,t-1}(h_{jt} - h_{j,t-1}), p_{j,t}(h_{jt} - h_{j,t-1})]
\]
    
    \[
l_j \in [l - Laspeyres, l - Paasche]
\]
Intensive vs extensive margins

- We decompose the change in total hours for the $j$ type $\Delta_j$ into:
  - an intensive component $I_j = p_{lj} \Delta h_j$
  - an extensive component $E_j = h_{Ej} \Delta p_j$

$$\Delta_{jt} = I_j + E_j$$

- We get intensive bounds
  - Assuming $p_{lj} \in [p_{j,t-1}, p_{jt}]$
    $$I_j \in [p_{j,t-1}(h_{jt} - h_{j,t-1}), p_{j,t}(h_{jt} - h_{j,t-1})]$$
    $$I_j \in [I - \text{Laspeyres}, I - \text{Paasche}]$$

- We get extensive bounds
  - From the identity $\Delta_{jt} = I_j + E_j$
    $$E_j \in [h_{j,t-1}(p_{jt} - p_{j,t-1}), h_{j,t}(p_{jt} - p_{j,t-1})]$$
    $$E_j \in [E - \text{Laspeyres}, E - \text{Paasche}]$$
Bounding Changes

At the limits, the change in total hours for any type $j$ satisfies two polar exact statistical decompositions:

$$\Delta_{jt} = q_{j,t-1} \left\{ [h_{jt} - h_{jt-1}]p_{jt} + [p_{jt} - p_{jt-1}]h_{jt-1} \right\}$$  \hspace{1cm} (1)

$$\Delta_{jt} = q_{j,t-1} \left\{ 1 - \text{Paasche} + E - \text{Laspeyres} \right\}$$
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$$
\Delta_{jt} = q_{j,t-1} \left\{ \left[ h_{jt} - h_{jt-1} \right] p_{jt} + \left[ p_{jt} - p_{jt-1} \right] h_{jt-1} \right\} 
$$  \hspace{1cm} (1)

$$
\Delta_{jt} = q_{j,t-1} \left\{ I - Paasche + E - Laspeyres \right\} 
$$

or

$$
\Delta_{jt} = q_{j,t-1} \left\{ \left[ h_{jt} - h_{jt-1} \right] p_{jt-1} + \left[ p_{jt} - p_{jt-1} \right] h_{jt} \right\} 
$$  \hspace{1cm} (2)

$$
\Delta_{jt} = q_{j,t-1} \left\{ I - Laspeyres + E - Paasche \right\} 
$$
Bounding changes

Figure 14: Decomposing the changes at the extensive and intensive margins by age and gender (1977-2007)

<table>
<thead>
<tr>
<th></th>
<th>Year</th>
<th>Men 16-29</th>
<th>Women 16-29</th>
<th>Men 30-54</th>
<th>Women 30-54</th>
<th>Men 55-74</th>
<th>Women 55-74</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Δ</td>
<td>-82</td>
<td>-38</td>
<td>-82</td>
<td>36</td>
<td>-36</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>E-L, E-P</td>
<td>[-35, -29]</td>
<td>[14, 17]</td>
<td>[-25, -22]</td>
<td>[41, 41]</td>
<td>[-23, -20]</td>
<td>[15, 17]</td>
</tr>
<tr>
<td></td>
<td>Δ</td>
<td>-71</td>
<td>-9</td>
<td>-70</td>
<td>39</td>
<td>-42</td>
<td>10</td>
</tr>
<tr>
<td>US</td>
<td>I-P, I-L</td>
<td>[-6, -6]</td>
<td>[1, 1]</td>
<td>[-5, -5]</td>
<td>[14, 19]</td>
<td>[3, 3]</td>
<td>[3, 5]</td>
</tr>
<tr>
<td></td>
<td>E-L, E-P</td>
<td>[-13, -13]</td>
<td>[21, 21]</td>
<td>[-14, -14]</td>
<td>[72, 77]</td>
<td>[3, 3]</td>
<td>[33, 35]</td>
</tr>
<tr>
<td></td>
<td>Δ</td>
<td>-19</td>
<td>22</td>
<td>-19</td>
<td>90</td>
<td>6</td>
<td>38</td>
</tr>
</tbody>
</table>
The young

Figure 15: Share of the 16-29 population in work

The young

Figure 15: Share of the 16-29 population in work
Figure 16: Share of the 16-29 population looking for work
Figure 17: Share of the 16-29 population in school and not in work
Figure 18: Male employment rate from 50 to 74 (1977)
Figure 19: Male employment rate from 50 to 74 (2007)
Recovering elasticities

**Objectives**
- Link up these changes at the extensive and intensive margins to movements in the distribution of taxes, relative wages, demographics and other incomes.
- Draw implication for extensive and intensive elasticities.
- Draw implications for the aggregate hours elasticity.
Recovering elasticities

- **Objectives**
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- **Aggregation issues**
  - How is the aggregate labour supply elasticity related to various micro elasticities?
Recovering elasticities

• **Objectives**
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  - Draw implications for the aggregate hours elasticity.

• **Aggregation issues**
  - How is the aggregate labour supply elasticity related to various micro elasticities?

• **Empirical issues (forthcoming)**
  - Use IFS microsimulation model TAXBEN
  - Estimation extensive and intensive elasticities
  - Similar approach for France and the US
Aggregation

• Consider preferences

\[ U = \begin{cases} 
\lambda R(h) + \frac{(T - h)^{1 - 1/\alpha}}{1 - 1/\alpha} - \beta & \text{if } h > 0 \\
\lambda s & \text{if } h = 0 
\end{cases} \]
Aggregation

- Consider preferences

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U = \begin{cases} 
\lambda R(h) + \frac{(T - h)^{1-1/\alpha}}{1 - 1/\alpha} - \beta & \text{if } h > 0 \\
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\end{cases}
\]

- where \( R(h) \) is the disposable income of someone who works \( h \) hours, \( s \) is income when unemployed
Aggregation

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- \( \lambda \) is the marginal utility of income, \( \alpha (T-h)/h \) is the Frisch elasticity
Aggregation

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• \( \beta \) (unobserved heterogeneity in) fixed costs of work.
Aggregation

• Consider preferences

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• \( \lambda \) is the marginal utility of income, \( \alpha (T-h)/h \) is the Frisch elasticity
• \( \beta \) (unobserved heterogeneity in) fixed costs of work.

• The 'aggregate' hours elasticity is given by

\[ \varepsilon = \frac{1}{H} \int_w \int_\alpha \int_\lambda p() h() [\varepsilon_I(\alpha, \lambda, w) + \varepsilon_E(\alpha, \lambda, w)] g(\alpha, \lambda, w) d\alpha d\lambda dw. \]
Aggregation

• Consider preferences

\[ U = \begin{cases} 
\lambda R(h) + \frac{(T - h)^{1 - 1/\alpha}}{1 - 1/\alpha} - \beta & \text{if } h > 0 \\
\lambda s & \text{if } h = 0 
\end{cases} \]

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• \( \beta \) (unobserved heterogeneity in) fixed costs of work.

• The 'aggregate' hours elasticity is given by

\[ \varepsilon = \frac{1}{\tilde{H}} \int \int \int p(\alpha, \lambda, w) \left[ \varepsilon_I(\alpha, \lambda, w) + \varepsilon_E(\alpha, \lambda, w) \right] g(\alpha, \lambda, w) \, d\alpha \, d\lambda \, dw. \]

– \( h(\alpha, \lambda, w) \) hours, \( p(\alpha, \lambda, w) \) proportion of type \((\alpha, \lambda, w)\) workers
Summary

• We have proposed a systematic way of decomposing the importance of the extensive and the intensive margins of life-cycle labour supply in explaining the overall movements in aggregate hours of work.
Summary

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• We have shown how informative bounds can be developed on each of these margins.
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• We have shown how informative bounds can be developed on each of these margins.
• We have applied this analysis to the evolution of hours of work in the US, the UK and France over the past 30+ years.
Summary

• We have proposed a systematic way of decomposing the importance of the extensive and the intensive margins of life-cycle labour supply in explaining the overall movements in aggregate hours of work.
• We have shown how informative bounds can be developed on each of these margins.
• We have applied this analysis to the evolution of hours of work in the US, the UK and France over the past 30+ years.
• We have shown that the aggregate evolution cannot be ascribed to a single cause but covers very diverse movements at the extensive and extensive margins by age and gender.
Summary

• We have proposed a systematic way of decomposing the importance of the extensive and the intensive margins of life-cycle labour supply in explaining the overall movements in aggregate hours of work.
• We have shown how informative bounds can be developed on each of these margins.
• We have applied this analysis to the evolution of hours of work in the US, the UK and France over the past 30+ years.
• We have shown that the aggregate evolution cannot be ascribed to a single cause but covers very diverse movements at the extensive and extensive margins by age and gender.
• We have developed an approach to estimating the total hours elasticity from the distribution of micro elasticities at the extensive and intensive margins.