On the Allocation of Time –
A Quantitative Analysis of the US and France

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Motivation

What accounts for the cross–country differences in time allocation?

- Prescott (2004) put this question in the focus of quantitative macro

- Differences in taxes lead to large cross–country differences in market hours worked
Executive summary of our contribution

- **We document new facts about the allocation of NON–market hours**
  - Hours worked at home have remained roughly constant during 1960–2005
  - This has been the case not only in the US but also in the big European countries

- **We show that the growth model with a household sector can account for this**
  - The main forces are differences in taxes and labor productivities
  - The novelty of our work is to MEASURE labor productivity of home production, instead of calibrating it like the literature does
New facts about the allocation of non–market time

- Multinational Time Use Surveys (MTUS)

- Home production time vs. leisure
  - Ramey–Francis definitions
    - We include travel from/to work in market hours
    - They didn’t because they lacked data for the first half of last century
  - Hours expressed as
    - averages over working–age population 15–64 years old
    - shares of disposable time after sleep, personal care, education
  - Definitions of broad categories
  - Number of surveys and participants
Non–market time in Europe and the US during 1960–2010

Weekly Hours of Home Work

Weekly Hours of Leisure

Weekly hours of home work in the OECD 1960–2005

Duernecker and Herrendorf
Market time in Europe and the US during 1960–2010

Weekly Hours of Market Work

- USA
- France
- Germany
- UK

On the Allocation of Time
Accounting for the allocation of non–market time

- **We focus on the US and France 1970–2005**
  - US had the smallest and France the largest change in leisure
  - France has required data starting in 1970 (Germany and the UK don’t)
  - By ending in 2005, we avoid the Great Recession
  - **Ramey–Francis vs. Aguiar–Hurst definitions**
• **What we do**
  - Build a growth model with a household sector
  - Measure the productivity of home production for both the US and France
  - Calibrate the model to match the US time allocation
  - Feed into the model the French taxes and productivities in the market and at home

• **What we find**
  - The model easily matches the US time allocation
  - The model generates the French time allocation with constant home hours
  - It is key to use *measured* instead of *calibrated* home productivities
Model

Growth model with market and household sector

Stand-in household

- Abstracts from heterogeneity in the population
- Natural first step to account for average hours per working-age population
- Next step is to disaggregate average allocation of time into subcategories
Environment

Endowments

- One unit of time
- Initial stocks of market and home capital
Preferences

- Households derive utility from
  - Consumption: $C$
    - Market–produced: $C_m$
    - Home–produced: $C_h$
  - Leisure: $L$

- Utility function

\[
U(C, L) = \alpha_u \log(C - \bar{C}) + (1 - \alpha_u) \log(L)
\]

\[
C = \left[\alpha_c C_m^{\sigma_c} + (1 - \alpha_c) C_h^{\sigma_c}\right]^{\frac{1}{\sigma_c}}
\]

- Subsistence term $\bar{C} > 0$ implies income elasticity of leisure larger one
Technology

\[ C_m + \frac{X_m}{B_m} + \frac{X_h}{B_h} = (K_m)^{\alpha_m}(A_m H_m)^{1-\alpha_m} \]

\[ C_h = [\alpha_h (K_h)^{\sigma_h} + (1 - \alpha_h)(A_h H_h)^{\sigma_h}]^{\frac{1}{\sigma_h}} \]

Feasibility

\[ K'_j = (1 - \delta_j)K_j + X_j \quad \text{where} \quad j \in \{m, h\} \]

\[ 1 = H_m + H_h + L \]
Equilibrium

Budget constraint

\[ C_m + p_h X_h + (1 + \tau_x) p_m X_m = (1 - \tau_w) w H_m + (1 - \tau_r) r K_m + T \]

- Taxes are effective, i.e., relative to consumption taxes:

\[ 1 + \tau_x \equiv \frac{1 + \tilde{\tau}_x}{1 + \tau_c}, \quad 1 - \tau_w \equiv \frac{1 - \tilde{\tau}_w}{1 + \tau_c}, \quad 1 - \tau_r \equiv \frac{1 - \tilde{\tau}_r}{1 + \tau_c} \]

- We define home capital to be consumer durables, which are not taxed
Definition of equilibrium

A competitive equilibrium consists of sequences of effective tax rates $\{\tau_{xt}, \tau_{wt}, \tau_{rt}\}$, prices $\{p_{ht}, p_{mt}, w_t, r_t\}$, allocations $\{H_{mt}, H_{ht}, L_t\}, \{K_{mt+1}, K_{ht+1}\}, \{X_{mt}, X_{ht}, C_{mt}, C_{ht}\}$ such that

- taking prices, wages, interest rates, effective tax rates and the initial capital stocks as given, $\{H_{mt}, H_{ht}, L_t, K_{mt+1}, K_{ht+1}, X_{mt}, X_{ht}, C_{mt}, C_{ht}\}$ solve the problem of the household (Details)

- taking prices and wages as given, $(H_{mt}, K_{mt})$ maximize firms profits

- markets clear.
Equilibrium Conditions

Allocation of time

- Equalize marginal utilities of leisure and market work:

\[
\frac{1 - \alpha_u}{L} = \alpha_u \frac{C^{1-\sigma_c}}{C - C} \alpha_c C_m^{\sigma_c - 1} (1 - \tau_w) w
\]

- Equalize marginal utilities of home work and market work:

\[
(1 - \alpha_c) C_h^{\sigma_c - \sigma_h} (1 - \alpha_h) A_h^{\sigma_h} H_h^{\sigma_h - 1} = \alpha_c C_m^{\sigma_c - 1} (1 - \tau_w) w
\]
Euler equations

• For market capital:

\[(1 + \tau_x)p_m \frac{C^{1-\sigma_c}}{C - \bar{C}}C_m^{\sigma_c-1} = \beta \frac{C'^{1-\sigma_c}}{C' - \bar{C}}C_m'^{\sigma_c-1}[(1 - \tau'_r)r' + (1 + \tau'_x)p'_m(1 - \delta_m)]\]

• For home capital:

\[p_h \frac{C^{1-\sigma_c}}{C - \bar{C}}\alpha_c C_m^{\sigma_c-1} = \beta \frac{C'^{1-\sigma_c}}{C' - \bar{C}}\left[(1 - \alpha_c)C_h^{\sigma_c-\sigma_h}\alpha_h K_h^{\sigma_h-1} + p_h'\alpha_c C_m'^{\sigma_c-1}(1 - \delta_h)\right]\]
Connecting the Model to the US Economy

Normalizations


Two values for each the two capital stocks

- Model does not have a balanced growth path

- Impose \( p_mK_m/Y_m \) and \( p_hK_h/Y_h \) for 1970, 2005 (OECD)
Observed parameters

- $\beta = 0.96$: standard value
- $\delta_m, \delta_h$: depreciation rates of market capital and consumer durables (BEA)
- $\alpha_m = 0.37$: capital share (BEA)
- $B_m = p_m^{-1}, B_h = p_h^{-1}$ and 1970, ..., 2005: relative prices of investments (OECD)
- $\tau_x, \tau_w, \tau_r$ for 1970, ..., 2005: average effective tax rates (McDaniel)
Joint calibration

- Unobserved parameters
  - $\alpha_u$, $\alpha_c$, $\alpha_h$
  - $\sigma_c$, $\sigma_h$
  - $\bar{C}$
  - $A_m$, $A_h$ for 1971, ..., 2005

- Targets
  - $p_h X_h / Y_m$ for 1970, 2005 (BEA)
  - $H_m$, $H_h$ for 1970, 2005 (MTUS)
  - $% \Delta (Y_m / H_m)$ for 1971, ..., 2005 (OECD)
  - $% \Delta (Y_h / H_h)$ for 1971, ..., 2005 (Own imputation)
Imputation of value added of home production

- **BEA Methodology underlying satellite accounts for home production**
  - Bridgman (2013) has details
  - Bridgman, Duernecker, Herrendorf (2014) apply methodology to OECD countries

- **Income approach to measuring value added**
  \[ Y_h = r_h K_h + w_h H_h \]

- **Measure inputs**
  - \( K_h \): consumer durables (from BEA)
  - \( H_h \): hours worked at home (from MTUS)

- **Impute rental prices**
  - \( r_h \): 10 year T–bill rate plus depreciation rate
  - \( w_h \): wage of workers in the private–households subsector
Background info about household workers

- **NAICS definition of the private household subsector**

  “Industries in the Private Households subsector include private households that engage in employing workers on or about the premises in activities primarily concerned with the operation of the household. These private households may employ individuals, such as cooks, maids, and butlers, and outside workers, such as gardeners, caretakers, and other maintenance workers.”

- **Number of household workers**

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<tr>
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</thead>
<tbody>
<tr>
<td>Hours (millions)</td>
<td>2,273</td>
<td>1,643</td>
<td>520</td>
<td>452</td>
</tr>
<tr>
<td>% of aggregate hours</td>
<td>1.42</td>
<td>0.65</td>
<td>1.22</td>
<td>1.15</td>
</tr>
<tr>
<td>Employment (thousands)</td>
<td>2,281</td>
<td>1,313</td>
<td>137</td>
<td>225</td>
</tr>
<tr>
<td>% of aggregate employment</td>
<td>2.60</td>
<td>0.87</td>
<td>0.64</td>
<td>0.85</td>
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</tbody>
</table>

Source: EU KLEMS
### Targets

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<tr>
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<tbody>
<tr>
<td>Share of hours worked in the market</td>
<td>$H_m$</td>
<td>32.6</td>
<td>32.6</td>
<td>30.2</td>
</tr>
<tr>
<td>Share of hours worked at home</td>
<td>$H_h$</td>
<td>19.9</td>
<td>19.9</td>
<td>20.4</td>
</tr>
<tr>
<td>Share of durables expenditure in GDP</td>
<td>$p_hX_h/Y_m$</td>
<td>0.11</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>Capital–output ratio in the market</td>
<td>$p_mK_m/Y_m$</td>
<td>2.99</td>
<td>3.14</td>
<td>2.99</td>
</tr>
<tr>
<td>Capital–output ratio at home</td>
<td>$p_hK_h/Y_h$</td>
<td>1.04</td>
<td>1.55</td>
<td>1.04</td>
</tr>
</tbody>
</table>
Growth rates of productivity and technological change (in %)

<table>
<thead>
<tr>
<th></th>
<th>Data</th>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>Labor productivity of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>market production</td>
<td>$\Delta Y_m/H_m$</td>
<td>1.69</td>
</tr>
<tr>
<td>home production</td>
<td>$\Delta Y_h/H_h$</td>
<td>0.07</td>
</tr>
<tr>
<td>Technological change in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>market production</td>
<td>$\Delta A_m$</td>
<td></td>
</tr>
<tr>
<td>home production</td>
<td>$\Delta A_h$</td>
<td></td>
</tr>
<tr>
<td>market investment</td>
<td>$\Delta B_m$</td>
<td></td>
</tr>
<tr>
<td>home investment</td>
<td>$\Delta B_h$</td>
<td></td>
</tr>
</tbody>
</table>

Key features

- Labor–augmenting technological regress at home
  - Average American forgot how to cook, iron, clean, ...
  - Unlearning by not doing
- Growth of labor productivity of home production
  - Massive investments in home durables
## Calibrated parameter values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight on consumption</td>
<td>$\alpha_u$ 0.54</td>
</tr>
<tr>
<td>Weight on market–produced consumption</td>
<td>$\alpha_c$ 0.79</td>
</tr>
<tr>
<td>Weight on home capital</td>
<td>$\alpha_h$ 0.08</td>
</tr>
<tr>
<td>Non–homotheticity term</td>
<td>$\bar{C}$ 0.10</td>
</tr>
<tr>
<td>Elasticity between home capital and home labor</td>
<td>$1/(1 - \sigma_h)$ 0.88</td>
</tr>
<tr>
<td>Elasticity between market and home–produced consumption</td>
<td>$1/(1 - \sigma_c)$ 0.76</td>
</tr>
</tbody>
</table>
Key features of calibrated parameters

- $\tilde{C} = 0.10$: Positive subsistence level of market goods
  - $\tilde{C}/C(1970) = 0.17$
  - $\tilde{C}/C(2005) = 0.11$

- $1/(1 - \sigma_h) = 0.88$: Home capital and home hours are complements
  - Ramey (JEHist, 2009): Elasticity of 0.8 between appliances and home hours
• $1/(1 - \sigma_c) = 0.76$: Market and home–produced consumption are complements

- Typical elasticity of substitution in the literature around 2
  - Rogerson, Rupert, Wright (1995)
  - McGrattan, Rogerson, Wright (1997)
  - Rogerson (2008)

- Micro evidence in the literature is about
  - close market substitutes to home consumption (e.g., food vs. restaurants)
  - individuals who work full time

- Our calibration is for
  - all market consumption (e.g., home surgery vs. market surgery)
  - all working–age individuals
Accounting for the French Time Allocation

- Impose initial and terminal values on the two capital stocks
  - \( p_j K_j / Y_j \) with \( j \in \{m, h\} \) for 1970, 2005 (OECD)

- Feed taxes and technological progress into the model
  - \( \tau_x, \tau_w, \tau_r \) for 1970, ..., 2005
    (McDaniel, next slide has graph)
  - \( B_j = 1/p_j \) with \( j \in \{m, h\} \) for 1970, ..., 2005 (OECD)
  - \( A_j \) with \( j \in \{m, h\} \) for 1970, ..., 2005 so as to hit \( (Y_j/H_j)^{FR}/(Y_j/H_j)^{US} \)
    (OECD and own imputation, second next slide has graph)
Taxes in France and the US

Effective Tax Rate on Labor, Capital and Investment

- Labor Tax: USA
- France
- Capital Tax: USA
- France
- Investment Tax: USA
- France
Labor productivities in the US and France

Decomposition of growth of home labor productivity
Wages of French household workers in comparison

Average hourly wages (in current EUR)

<table>
<thead>
<tr>
<th></th>
<th>1970</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total economy</td>
<td>1.9</td>
<td>25.8</td>
</tr>
<tr>
<td>Household sector</td>
<td>0.7</td>
<td>13.6</td>
</tr>
<tr>
<td>Minimum wage</td>
<td>0.6</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Sources: OECD; EU KLEMS
US and French hours: model vs. data

Market Production Hours

Home Production Hours

Leisure Time

Capital–output ratios in the model vs. data

Duernecker and Herrendorf
Intuition

- Assume there is no capital for simplicity. Then:

\[
\frac{H_m}{H_h} = \left[ (1 - \tau_w) \frac{\alpha_c}{1 - \alpha_c} \right]^{\epsilon_c} \left[ \frac{A_h}{A_m} \right]^{1 - \epsilon_c}
\]

\[
L = \frac{1 - \alpha_u}{\alpha_u (1 - \tau_w) + (1 - \alpha_u)} \left[ 1 - \tau_w H_h - \frac{\bar{C}}{w/P} \right]
\]

where

\[
P \equiv \left[ \alpha_c^{\epsilon_c} + (1 - \alpha_c)^{\epsilon_c} p_h^{1 - \epsilon_c} \right]^{\frac{1}{1 - \epsilon_c}}
\]

\[
p_h = \frac{(1 - \tau_w)w}{A_h}
\]

\[
\epsilon_c \equiv \frac{1}{(1 - \sigma_c)} \in [0, \infty)
\]
On the Allocation of Time

- **US**
  - Small change in $\bar{C}/C$ leads to some reallocation from hours worked to leisure
  - Increasing market productivity leads to reallocation away from market hours
    - home and market consumption complements (logic like in Ngai–Pissarides)
    - small because CES aggregator close to Cobb–Douglas
  - No effects from unchanged labor income taxes
  - Net effects
    - Home hours stay constant because opposing effects offset each other
    - Leisure increases somewhat and market hours decrease somewhat
• France
  ◦ Large change in $\bar{C}/C$ leads to large reallocation from hours worked to leisure
  ◦ Labor income tax increases lead to
    ◦ further reallocation from hours worked to leisure
    ◦ reallocation of from market to home hours
  ◦ No effects from productivity because market vs. home productivity stays unchanged
  ◦ Net effects
    ◦ Home hours stay constant because opposing effects offset each other
    ◦ Leisure increases a lot and market hours decrease a lot
What about the marketization of consumption?

- Marketization hypothesis of Freeman–Schettkat
  - Americans replaced home consumption by market consumption
  - Continental Europeans didn’t

- Literature focuses on relative hours
  - Hours don’t say much about marketization
  - Both countries have flat home hours
  - US market hours fall somewhat whereas French market hours fall a lot

- Need relative labor productivities to understand what happened to consumption
  - US: Ratio of market–to–home productivity rises
  - France: Ratio of market–to–home productivity rises less than in US
  - Next slide shows implied behavior of market–to–home consumption
Ratios of market to home consumption in the data vs. the model

Normalize US 1970 ratio to one, express French ratio relative to US
Counterfactuals

1. US with French labor–income taxes

2. France with US home technological change

3. Elasticity market vs. home consumption equal two
   Calibrated home labor productivities
   (in the spirit of Rogerson (JPE, 2008))
Counterfactual 1: US with French labor–income taxes

- Market work: difference in effective income taxes do most of the job
- Home work and leisure are off in first half of the sample

Duernecker and Herrendorf
Counterfactual 2: France with US home technological change

- French now work more at home because US home labor productivity grows less
Counterfactual 3: Set $\frac{1}{1 - \sigma_c} = 2$ and calibrate home labor productivities

- While home hours look fine, there is too little change in market hours and leisure
More importantly, there now is “home–ization” of consumption

Calibrated labor productivities

Duernecker and Herrendorf
Conclusion

Our contributions

- We documented new facts about the allocation of time in the US and France
- We showed that the growth model with home production can account for them
- We found it’s key to use measured instead of calibrated home labor productivities

Next steps

- Extend the analysis to other European countries
- Understand why home technological change is strong in France and weak in US
Defensive Slides
**Definitions of market work, home work, and leisure**

<table>
<thead>
<tr>
<th>Market Work</th>
<th>Home Work</th>
<th>Leisure</th>
<th>Personal Care and Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paid work</td>
<td>Active sports participation</td>
<td>Study, homework</td>
<td>Read books</td>
</tr>
<tr>
<td>Paid work at home</td>
<td>Passive sports participation</td>
<td>Read papers, magazines</td>
<td>Relax</td>
</tr>
<tr>
<td>Paid work, second job</td>
<td>Walking</td>
<td>Relax</td>
<td>Conversation</td>
</tr>
<tr>
<td>Travel to/from work</td>
<td>Religious activities</td>
<td>Relax</td>
<td>Entertainment at home</td>
</tr>
<tr>
<td>Cook, wash up</td>
<td>Civic activities</td>
<td>Conversation</td>
<td>Knit, sew</td>
</tr>
<tr>
<td>Housework</td>
<td>Cinema or theatre</td>
<td>Entertainment at home</td>
<td>Other leisure</td>
</tr>
<tr>
<td>Odd jobs</td>
<td>Dances or parties</td>
<td>Entertainment at home</td>
<td>Sleep</td>
</tr>
<tr>
<td>Gardening</td>
<td>Social clubs</td>
<td>Drugstore/waiter</td>
<td>Dress/personal care</td>
</tr>
<tr>
<td>Shopping</td>
<td>Pubs</td>
<td>Other care</td>
<td>Consume personal services</td>
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<tr>
<td>Childcare</td>
<td>Restaurants</td>
<td>Other care</td>
<td>School, classes</td>
</tr>
<tr>
<td>Domestic travel</td>
<td>Visit friends at their homes</td>
<td>Other care</td>
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<tr>
<td>Meals and snacks</td>
<td>Listen to radio</td>
<td>Other care</td>
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<tr>
<td>Free time travel</td>
<td>Watch television or video</td>
<td>Other care</td>
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<tr>
<td>Excursions</td>
<td>Listen to records, tapes, CDs</td>
<td>Other care</td>
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Back
### Number of surveys and participants

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<tbody>
<tr>
<td><strong>USA</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td>1,965</td>
<td>5,807</td>
<td>2,539</td>
<td>6,178</td>
<td>937</td>
<td>1,720</td>
<td>16,760</td>
<td>11,187</td>
<td>10,564</td>
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<tr>
<td><strong>Females</strong></td>
<td>1,082</td>
<td>3,264</td>
<td>1,340</td>
<td>3,307</td>
<td>543</td>
<td>977</td>
<td>9,320</td>
<td>6,204</td>
<td>5,902</td>
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<tr>
<td><strong>Males</strong></td>
<td>883</td>
<td>2,543</td>
<td>1,199</td>
<td>2,871</td>
<td>394</td>
<td>743</td>
<td>7,440</td>
<td>4,983</td>
<td>4,662</td>
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<tr>
<td><strong>France</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td>2,898</td>
<td>4,633</td>
<td>12,393</td>
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<tr>
<td><strong>Males</strong></td>
<td>1,460</td>
<td>2,202</td>
<td>5,987</td>
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<tr>
<td><strong>Females</strong></td>
<td>1,438</td>
<td>2,431</td>
<td>6,406</td>
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<tr>
<td><strong>Germany</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td>2,137</td>
<td>21,801</td>
<td>27,583</td>
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<tr>
<td><strong>Males</strong></td>
<td>945</td>
<td>10,531</td>
<td>12,827</td>
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<tr>
<td><strong>Females</strong></td>
<td>1,192</td>
<td>11,270</td>
<td>14,756</td>
<td></td>
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<tr>
<td><strong>UK</strong></td>
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<td></td>
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<tr>
<td><strong>Total</strong></td>
<td>8,360</td>
<td>14,301</td>
<td>7,432</td>
<td>10,841</td>
<td>1,422</td>
<td>14,169</td>
<td>3,614</td>
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<tr>
<td><strong>Males</strong></td>
<td>4,163</td>
<td>6,753</td>
<td>2,934</td>
<td>5,001</td>
<td>679</td>
<td>6,520</td>
<td>1,646</td>
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<tr>
<td><strong>Females</strong></td>
<td>4,197</td>
<td>7,548</td>
<td>4,498</td>
<td>5,840</td>
<td>743</td>
<td>7,649</td>
<td>1,968</td>
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</tbody>
</table>
Weekly hours of home work in the OECD 1960–2010
### Alternative definitions of market work, home work, and leisure

<table>
<thead>
<tr>
<th></th>
<th>Panel (i) Baseline</th>
<th>Panel (ii) 1965 Demographics</th>
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<tbody>
<tr>
<td><strong>USA</strong></td>
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<tr>
<td>Market</td>
<td>34.6</td>
<td>32.6</td>
</tr>
<tr>
<td>Home</td>
<td>20.4</td>
<td>19.9</td>
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<tr>
<td>Leisure</td>
<td>45.0</td>
<td>47.5</td>
</tr>
<tr>
<td><strong>France</strong></td>
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<td></td>
</tr>
<tr>
<td>Market</td>
<td>36.3</td>
<td>33.5</td>
</tr>
<tr>
<td>Home</td>
<td>25.1</td>
<td>23.7</td>
</tr>
<tr>
<td>Leisure</td>
<td>38.6</td>
<td>47.2</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Panel (iii) Childcare in leisure</th>
<th>Panel (iv) Education in leisure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USA</strong></td>
<td></td>
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</tr>
<tr>
<td>Market</td>
<td>34.6</td>
<td>32.6</td>
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<tr>
<td>Home</td>
<td>17.4</td>
<td>17.2</td>
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<tr>
<td>Leisure</td>
<td>48.0</td>
<td>51.2</td>
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<tr>
<td><strong>France</strong></td>
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</tr>
<tr>
<td>Market</td>
<td>36.3</td>
<td>33.5</td>
</tr>
<tr>
<td>Home</td>
<td>21.1</td>
<td>20.2</td>
</tr>
<tr>
<td>Leisure</td>
<td>42.6</td>
<td>46.7</td>
</tr>
</tbody>
</table>

Sources: MTUS
Household’s problem

\[ L = \sum_{t=0}^{\infty} \beta^t \left\{ \alpha_u \log(C(t) - \bar{C}) + (1 - \alpha_u) \log(L(t)) \right. \]

\[ + \eta_c(t) \left[ \left( \alpha_c C_m(t)^{\sigma_c} + (1 - \alpha_c) C_h(t)^{\sigma_c} \right)^{\frac{1}{\sigma_c}} - C(t) \right] \]

\[ + \eta_h(t) \left[ \left( \alpha_h K_h(t)^{\sigma_h} + (1 - \alpha_h) (A_h(t) H_h(t))^{\sigma_h} \right)^{\frac{1}{\sigma_h}} - C_h(t) \right] \]

\[ + \lambda(t) \left[ [1 - \tau_w(t)] w(t) H_m(t) + [1 - \tau_r(t)] r(t) K_m(t) + T(t) \right. \]

\[ \left. - C_m(t) - p_h(t) X_h(t) - [1 + \tau_x(t)] p_m(t) X_m(t) \right] \]

\[ + \phi_m(t) \left[ (1 - \delta_m) K_m(t) + X_m(t) - K_m(t+1) \right] \]

\[ + \phi_h(t) \left[ (1 - \delta_h) K_h(t) + X_h(t) - K_h(t+1) \right] \]

\[ + \mu(t) \left[ 1 - L(t) - H_m(t) - H_h(t) \right] \} \]
Calibrated Technological Progress

Technological Progress (normalized, 1970 = 1)

- Market Production
- Home Production
- Market Capital
- Home Capital

On the Allocation of Time
US and French capital–output ratios: model vs. data
## Decomposition of annual growth rates of home labor productivity

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>0.13</td>
<td>2.75</td>
</tr>
<tr>
<td>Contribution of capital services</td>
<td>0.33</td>
<td>0.49</td>
</tr>
<tr>
<td>Contribution of labor services</td>
<td>-0.20</td>
<td>2.26</td>
</tr>
</tbody>
</table>
Calibrated labor productivities Counterfactual 3
Counterfactual 4: France with US effective taxes

**Hours of Market Work**

- U.S. Benchmark
- France with U.S. labor taxes
- France

**Hours of Home Work**

- U.S. Benchmark
- France with U.S. labor taxes
- France

**Leisure Time**

- U.S. Benchmark
- France with U.S. labor taxes
- France