Estimating Intra-Household Sharing from Time-Use Data

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Motivation

- Contribute to growing lit on measuring intra-hh sharing and individual-level inequality
  - lit finds equal sharing does not hold
- Key to estimate inequality accurately
  - levels & dimensions of inequality
  - impact: policy targeting and evaluation
- Ultimate goal
  - wide application of methods by non-academic institutions
  - replace per-capita approach

Contributions to recent literature

- Estimation from one assignable good, typically clothing
  - Extension to time-use
  - Possibility of using private leisure as the assignable good
  - Increase accuracy of sharing rule estimates
- Private (shareable) goods only
  - Extension to public goods (key source of hh economies of scale)
  - Increase accuracy of individual-level inequality estimates
- Linear estimation from widely available data
  - With or without price variation
  - Can estimate sharing from time-use data alone

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Application to UK hetero working couples

- Participating households only
- On average, women have fewer resources than men
- Average gender gap in consumption: 8.53%
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Collective model

$$\max \sum_t \mu_{t,h}(\boldsymbol{z_h})\, u_t\left(\boldsymbol{c_{t,h}}, \boldsymbol{X_h}, \ell_{t,h}, JT_h, D_h\right)$$

- Pareto weights $\sum_t \mu_{t,h}(\boldsymbol{z_h}) = 1$
- Private material goods $\boldsymbol{c}$
- Public material goods $\boldsymbol{X}$
- Time feasibility constraint: $\ell_{t,h} + d_{t,h} + jt_{t,h} + m_{t,h} = 1$
- Budget constraint: $\sum_t \left(\boldsymbol{pc_{t,h}} + w_{t,h}\left(\ell_{t,h} + d_{t,h} + jt_{t,h}\right)\right) + \boldsymbol{rX_h} = y_h$
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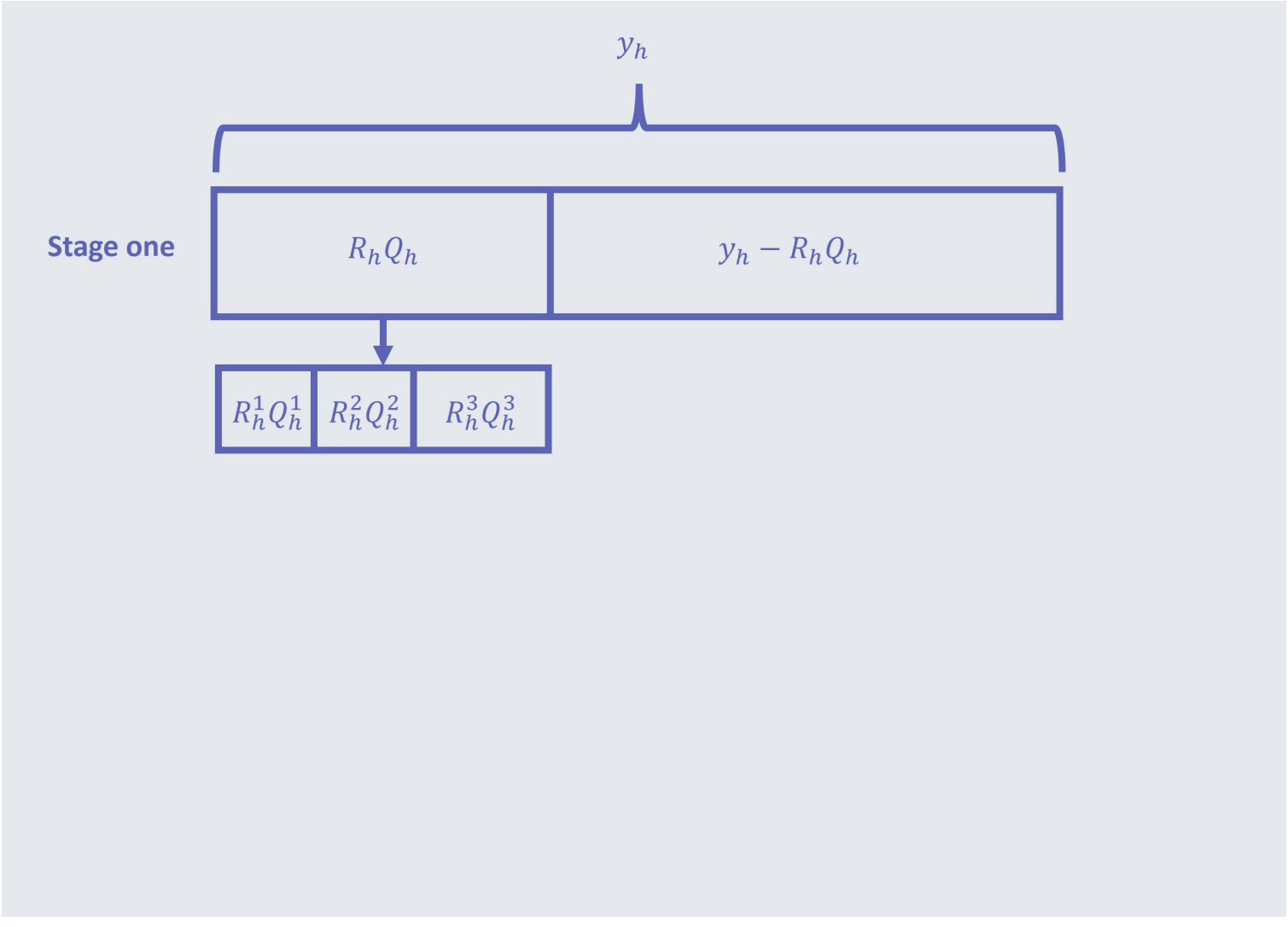
Two-stage representation



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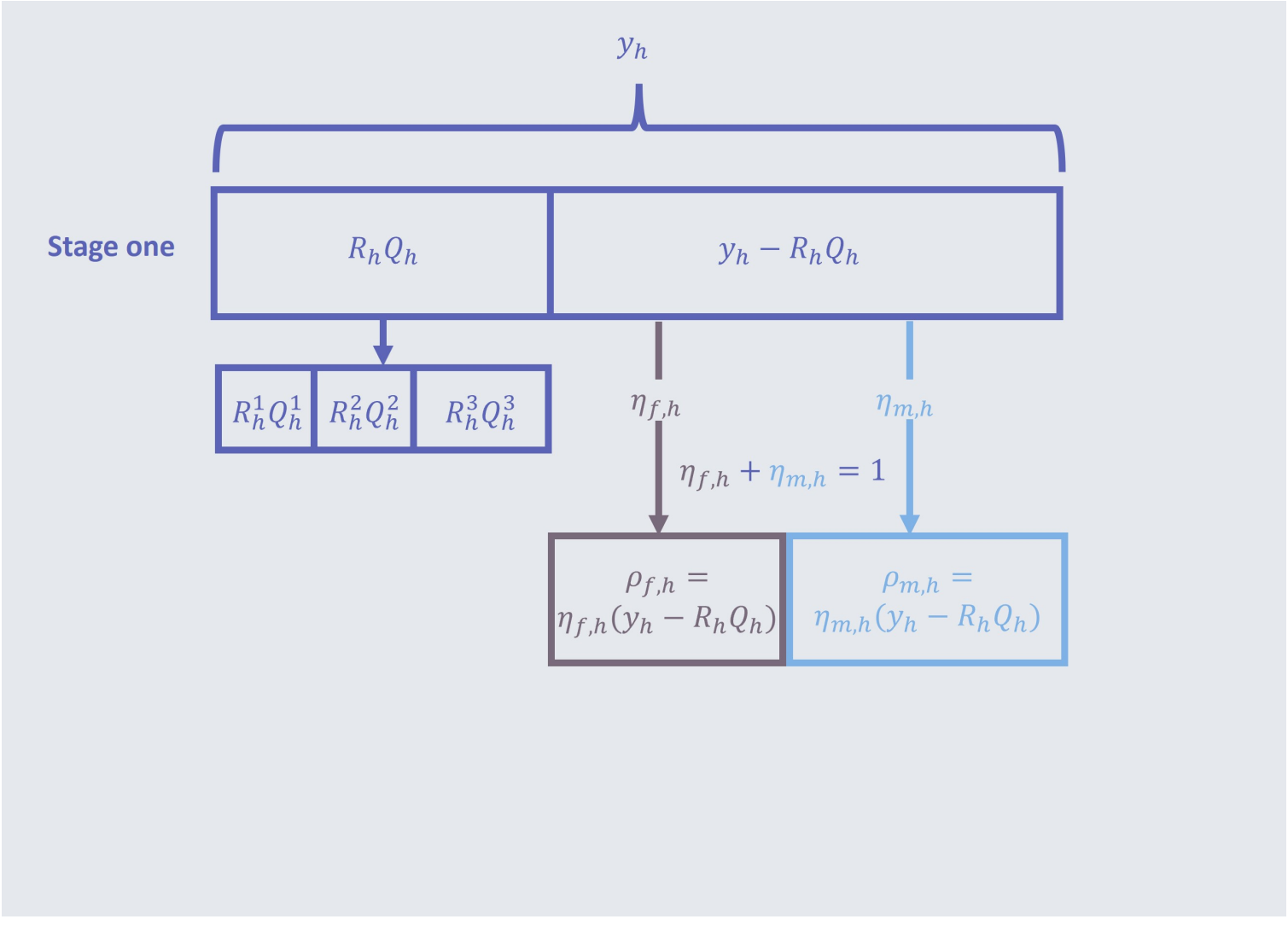

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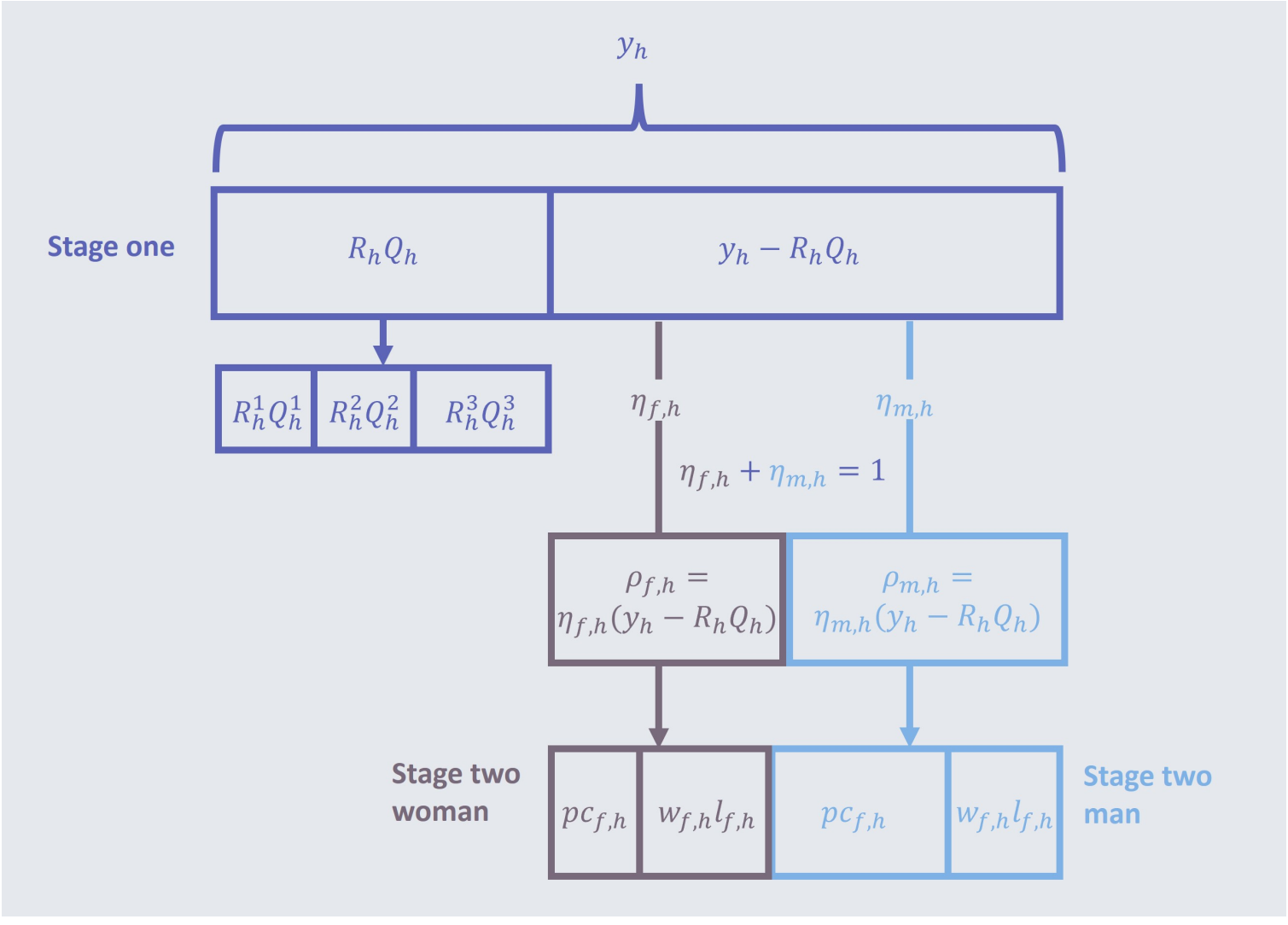

Outline

Identification

- Sharing rule identified from second-stage demand for assignable good
  - $\ell_{t,h}\left(\boldsymbol{p}, w_{t,h}, \boldsymbol{Q_h}, (y_h - \boldsymbol{R_h Q_h})\eta_{t,h}\right)$
- Individual-level data on one good only
- Identifying assumptions: SAP or SAT
  - Alternative SRAT assumption
- General identification result with weak functional form restrictions
  - PIGLOG, PIGL, LES...
- Linear approximation of resource share (or Pareto weight and sub into resource share)
  - $\eta_{t,h} = \eta_t^0 + \sum_z \eta_t^z \hat{z}_h$
    - $\sum_t \eta_t^0 = 1$, $\sum_t \eta_t^z = 0$, $\hat{z}_h = (z_h - \bar{z})$
  - Test of model fit if inside unit interval

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Worked example

- Parsimonious specification: Cobb-Douglas
- Expenditure on private leisure: $E^{\ell}_{t,h} = b^0_t y_h + \sum_z b^z_t y_h \hat{z}_h$
- Estimate by linear SUR
  - $b^0_t = \alpha^{\ell}_t \eta^0_t$
  - $b^z_t = \alpha^{\ell}_t \eta^z_t$
- **Assignable good CD-SAP** $\rightarrow \alpha^{\ell}_t = \alpha^{\ell}$
  - Consistent with UK singles data
  - $\widehat{\eta^0_t} = \frac{\widehat{b^0_t}}{\widehat{\sum_{i \in h} b^0_t}} = \frac{\widehat{\alpha^{\ell} \eta^0_t}}{\widehat{\sum_{s \in h} \alpha^{\ell} \eta^0_s}}$
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UK data

UKTUS (pooled 2000, 2014)

- 711 households (1,422 individuals)
- Very high-quality time-use data for everyone in the hh
- Activity, co-presence $\rightarrow$ accurate private leisure
- Characteristics including wages

LCF (2014)

- Large representative dataset used for official stats
- 583 households (i.e. 1,166 individuals)
- Detailed expenditure categories $\rightarrow$ categorise into private, public, to exclude

Resource share estimates

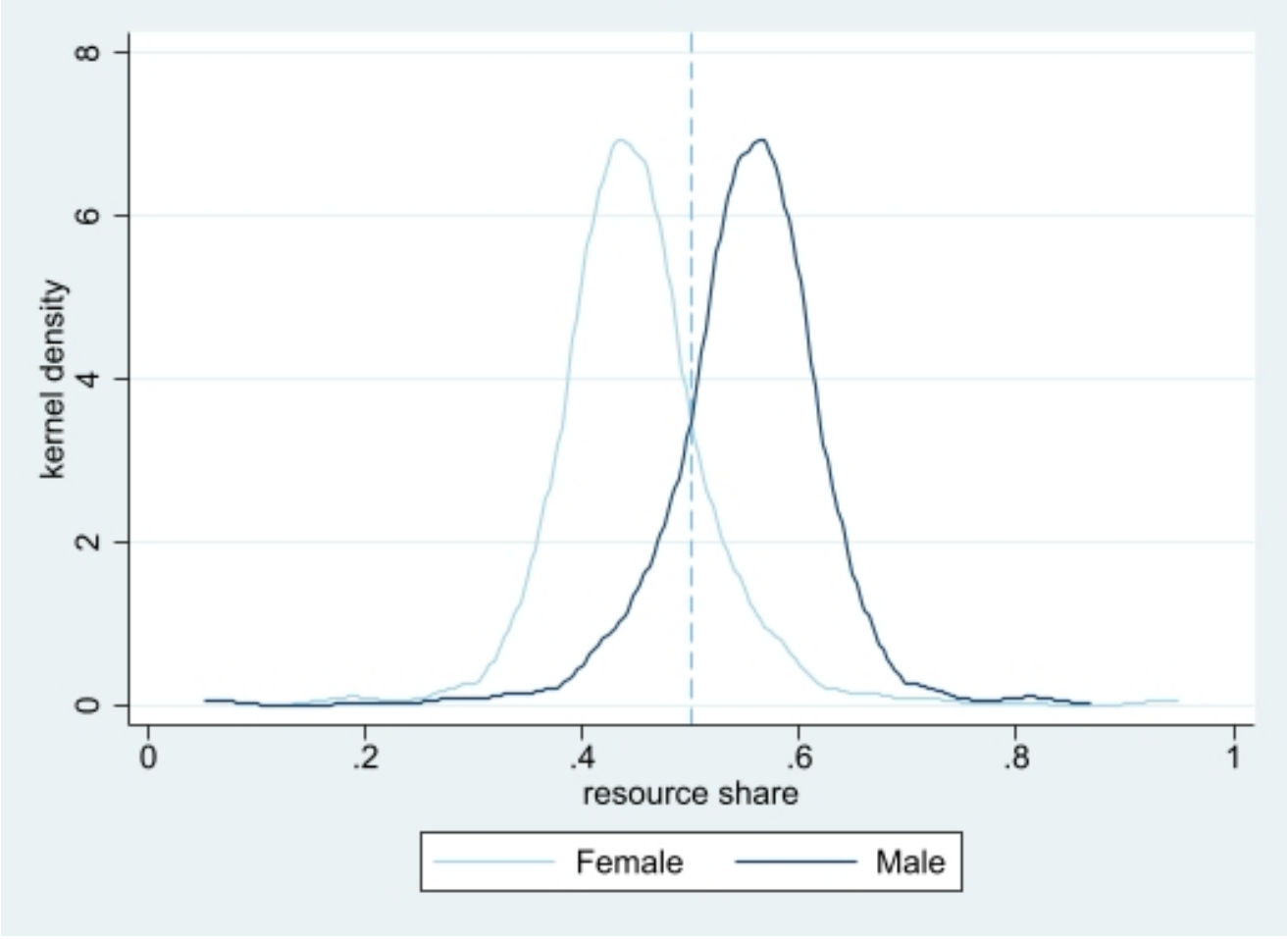

Figure: UKTUS 2000, 2014

Regression results
Clothing estimates

Applications

- Individual-level material consumption
  - On average, gender gap in LCF: 8.53%
  - Much higher than 0%... Equal sharing does not hold.
  - Gini: 0.21
  - 6% live in relative poverty
- Individual-level overall consumption (including time-use)
- Money-metric welfare estimates - Chiappori, Okuyama, Meghir (2023)
- Impact of distribution of resources on some outcome of interest
  - Impact of female empowerment on household emissions - Arduini & Le Henaff (wip)

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Regression results

Dependent variable	leisure expenditure	
Equation	male	female
Budget	0.243***	0.198***
	(0.00262)	(0.00236)
Budget * dev. fem. hourly pay	-0.00559***	0.00559***
	(0.000198)	(0.000198)
Budget * dev. mal. hourly pay	0.00215***	-0.00215***
	(6.87e-05)	(6.87e-05)
Budget * dev. fem. qualification	-0.00295	0.00295
	(0.00253)	(0.00253)
Budget * dev. mal. qualification	0.0154***	-0.0154***
	(0.00237)	(0.00237)
Budget * dev. average age	0.000905***	-0.000905***
	(0.000151)	(0.000151)
Budget * dev. age gap	0.000481	-0.000481
	(0.000338)	(0.000338)
Budget * dev. regional wealth	-5.44e-07**	5.44e-07**
	(2.19e-07)	(2.19e-07)
Observations (households)	711	711
R-squared	0.937	0.931

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

back

Leisure, clothing, and adjusted clothing estimates

- Clothing CD-SAP rejected in UK singles data (unlike leisure)
- Incorrect identifying assumption $\rightarrow$ overestimate women's shares
- Drop CD-SAP, adopt CD-SRAT: $\alpha_m^\ell = 2\alpha_f^\ell$

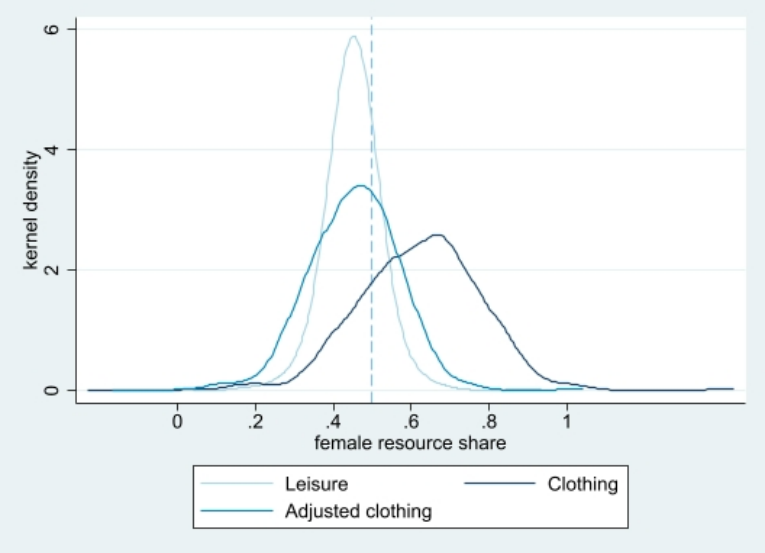

Figure: LCF 2014

- ...but clothing expenditure patterns are inconsistent with it being a private good. Negative correlation of clothing-based resource share estimates and (i) own share of budget, and (ii) baseline estimates

back