

# The Saturation of Spending Diversity and the Truth about Mr Brown and Mrs Jones

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"The preference hypothesis only acquires prima facie plausibility when it is applied to the statistical average. To assume that the representative consumer acts like an ideal consumers is a hypothesis worth testing; to assume that an actual person, the Mr. Brown or Mrs. Jones, who lives around the corner, does in fact act in such a way does not deserve a moment's consideration." J.R. Hicks - A Revision of Demand Theory (1956) -

## 1. Measuring Spending Diversity

- $n$  households (indexed by  $i$ );  $k$  expenditure categories
- Total expenditures of household  $i$ :  $x_i$
- Expenditure share of household  $i$  on good  $j$ :  $s_{ij}$
- Calculate **Entropy** of expenditure shares to measure spending diversity

**Individual Spending Diversity  $E_i$ :**

$$E_i = - \sum_{j=1}^k \phi(s_{ij}) \quad \begin{cases} \phi(s_{ij}) = s_{ij} \ln s_{ij} & s_{ij} > 0 \\ \phi(s_{ij}) = 0 & s_{ij} = 0 \end{cases} \quad (1)$$

⇒ Entropy  $E_i$  increases when expenditure shares become more equal

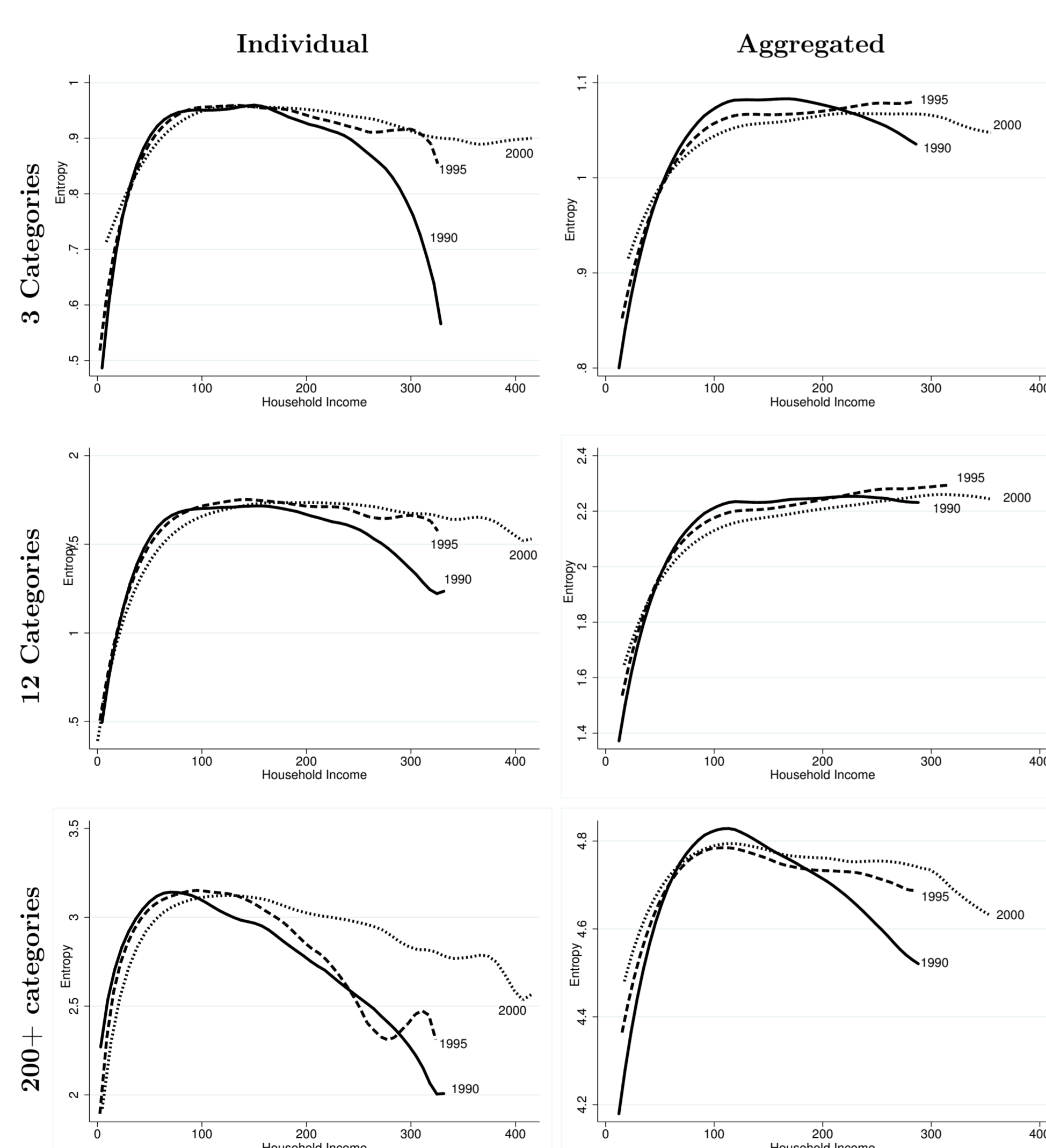
**Group Level Spending Diversity  $\hat{E}_d$ :**

- Households partitioned into 50 income groups
- Average expenditure shares within group  $d$ :  $\hat{s}_{jd} = [50/n] \sum_{i \in d} s_{ij}$
- Entropy of average shares:  $\hat{E}_d(\hat{s}_{jd})$

**Empirical approach:**

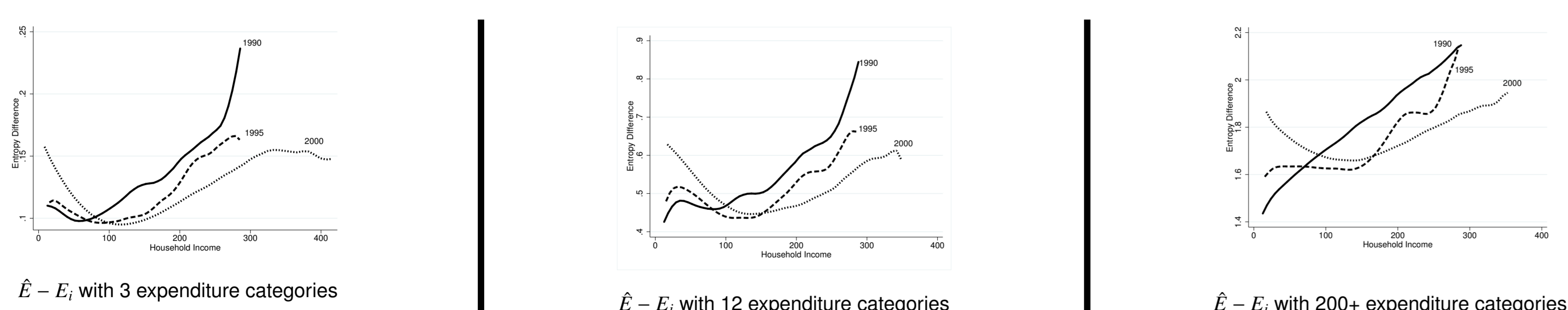
- **Data:** UK Family Expenditure Survey (1990 to 2000)
- Estimate  $E_i$  and  $\hat{E}$  as a function of expenditures  $x$

### 1.1 The Engel Curves for Spending Diversity



Notes: The Figures on the left show  $E_i$ , while the Figures on the right depict  $\hat{E}$ . Each row represents a different level of aggregation across expenditure categories. The number of observations was 6,047 in 1990, 5,984 in 1995 and 5,865 in 2000.

**Differences between Group Level and Individual Spending Diversities**



### 1.2 Stylized Facts

- **Stylized fact 1:** Inverse-U relation between individual spending diversity  $E_i$  and household income  $x_i$  ( $\neq$  cross-country studies like Clements et al., 2006).
- **Stylized fact 2:** Positive or inverse-U relation between group level spending diversity  $\hat{E}$  and average group income  $x$ .
- **Stylized fact 3:**  $\hat{E}$  exceeds  $E_i$  for each level of  $x$ .
- **Stylized fact 4:** The difference  $\hat{E} - E_i$  is either U-shaped in  $x$  or rises in  $x$ .

## 2 A Model of Spending Diversity

**Generalized Stone Geary** utility:

$$U_i = \left[ \sum_{j=1}^k \beta_{ij}^{\frac{\varepsilon}{\varepsilon-1}} (q_{ij} - \gamma_j)^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon-1}{\varepsilon}} \quad (2)$$

- $q_{ij} \geq 0$ : quantity of good  $j$  consumed by household  $i$
- $\gamma_j \geq 0$ : "subsistence consumption" level of good  $j$ ; **the same for all households**
- $\beta_{ij} \geq 0$  **can vary across households** ( $\sum_{j=1}^k \beta_{ij} = 1$ )
- $\varepsilon > 0$  determines substitutability between goods

**Budget constraint:**

$$x_i = \sum_{j=1}^k p_j q_{ij} \quad (3)$$

$p_j$  denotes price of good  $j$

### 2.1 An Example with Three Goods

**Setup:**

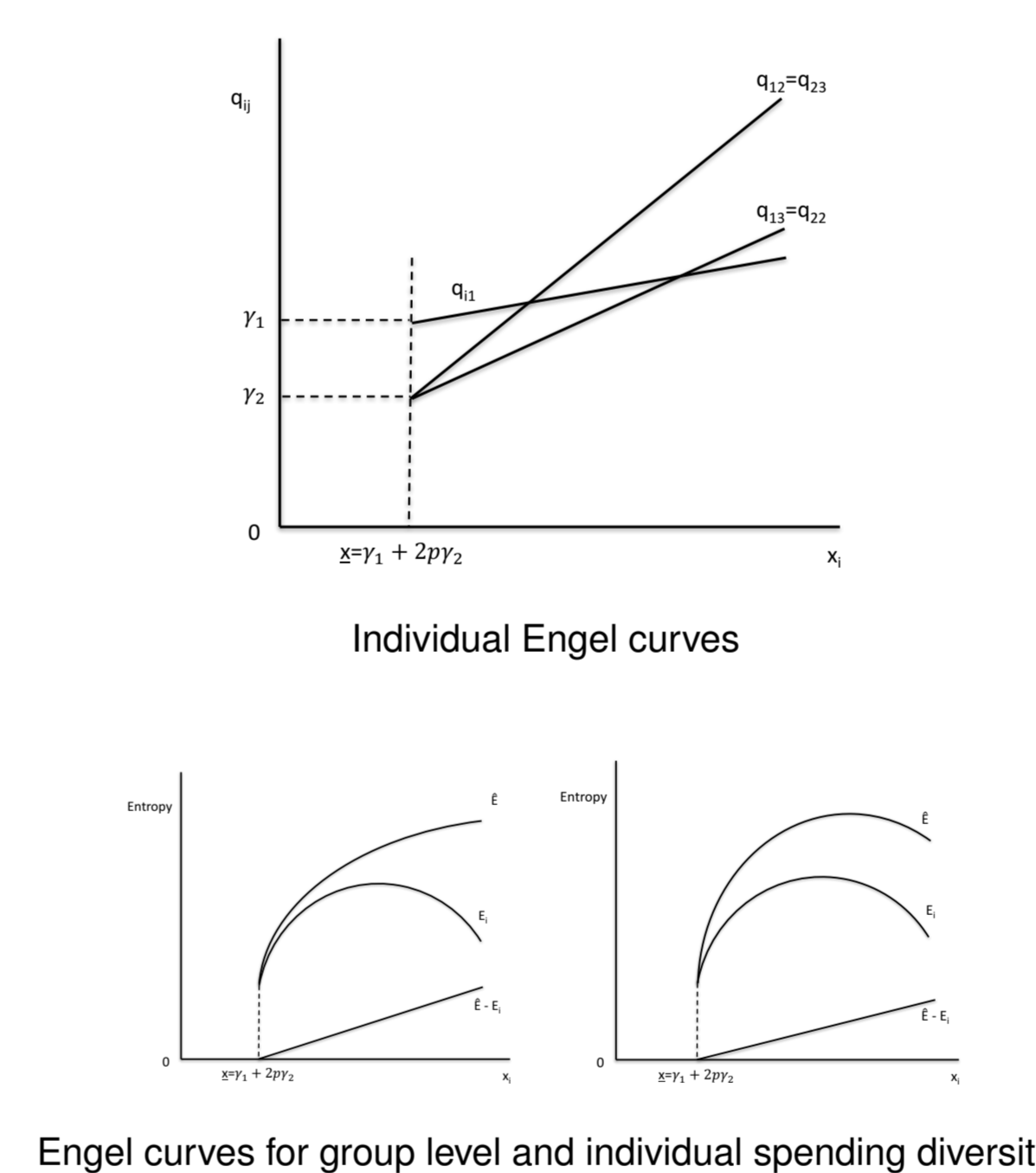
- Basic need good  $j = 1$  with  $\gamma_1 > 0$ ; two more luxurious goods  $j = 2$  and  $j = 3$  with  $\gamma_2 = \gamma_3 < \gamma_1$
- $p_1 = 1, p_2 = p_3 = p$
- Two (groups of) households ( $i = 1$  and  $i = 2$ ) with same expenditures  $x$
- $\beta_{i1} = 1 - \bar{\beta}$ : **equal preferences for good 1**
- **Opposite preferences regarding goods 2 and 3:**  $\beta_{12} = \beta_{23}$  and  $\beta_{13} = \beta_{22}$  ( $\beta_{i2} + \beta_{i3} = \bar{\beta}$ )

**Implications:**

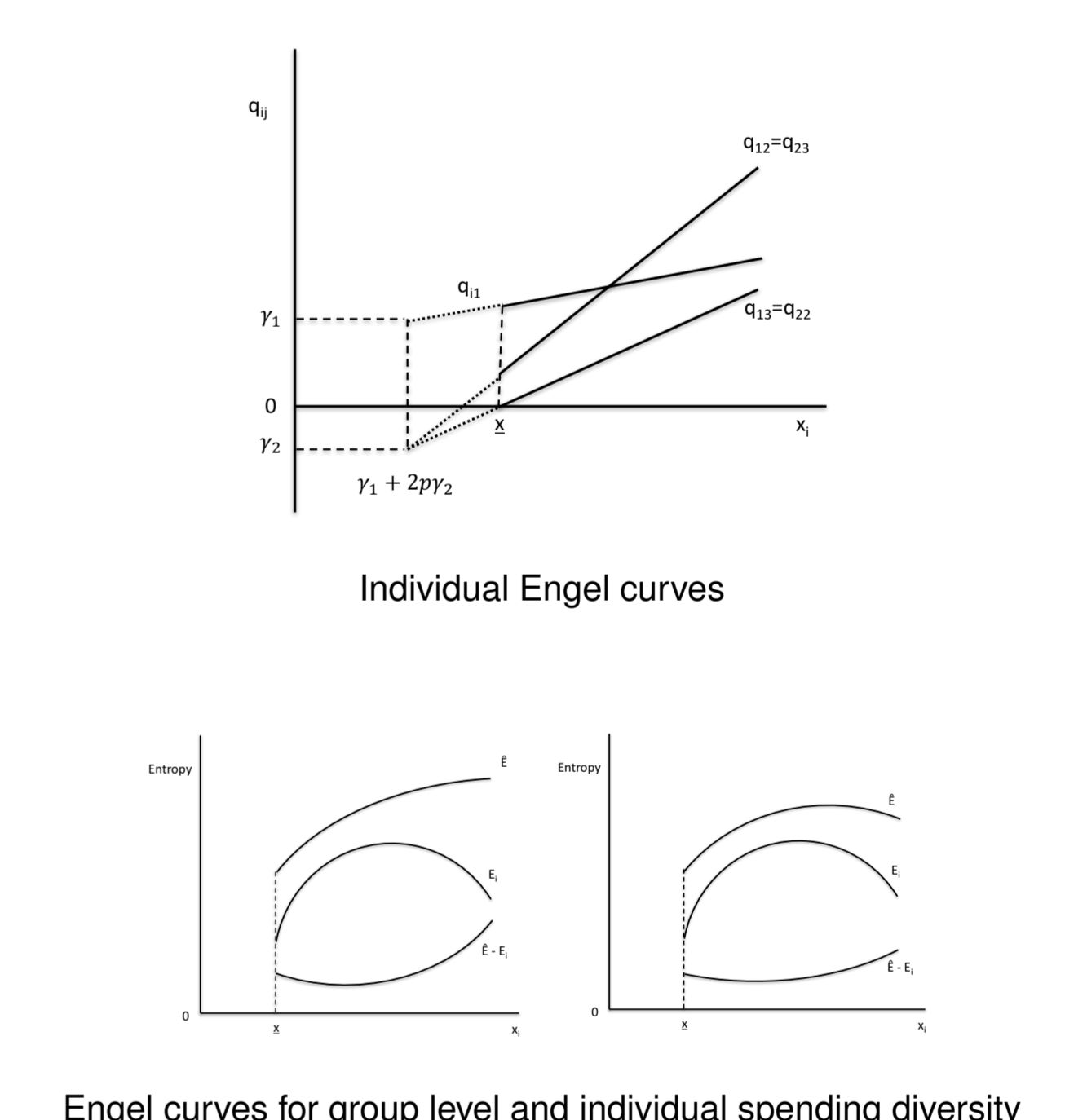
- **Aggregated demand  $Q_j = q_{1j} + q_{2j}$  for each good  $j$  is independent of preference heterogeneity**, i.e. of  $\beta_{i2}$  and  $\beta_{i3}$  (for  $\bar{\beta}, x$ , and  $p$  given)
- Aggregated demand can be derived from utility maximization problem of two (groups of) representative households with (per household) expenditures  $x_a = x$  and **average preferences**  $\beta_{a1} = 1 - \bar{\beta}$  and  $\beta_{a2} = \beta_{a3} = \frac{\bar{\beta}}{2}$

For a certain parameter range, the **model can generate all stylized facts:**

**Engel Curves when  $\gamma_2 > 0$**



**Engel Curves when  $\gamma_2 < 0$**



### 2.2 The Value of Product Variety

**Assumptions:**

- Same setup as 2.1; however, only the basic need good exists initially
- Goods 2 and 3 ( $\gamma_2 = \gamma_3 < 0$ ) can be **simultaneously** introduced through innovation or trade
- **Value of product variety:** amount  $F_i$  of good 1 that household  $i$  is willing to give up in order to be able to purchase all three goods (goods 2 and 3 at price  $p$ )

**Proposition 1**

A household with heterogeneous preferences ( $\beta_{ij} \neq \frac{\bar{\beta}}{2}$  for  $j \in \{2, 3\}$ ) values variety more than a household with average preferences ( $\beta_{a2} = \beta_{a3} = \frac{\bar{\beta}}{2}$ ) does and the more so, the more heterogeneous these preferences are (i.e.  $F_i > F_a$  holds, with  $\frac{\partial F_i}{\partial \beta_{ij}} > 0$  when  $\beta_{ij} > \frac{\bar{\beta}}{2}$ ). Small degrees of preference heterogeneity can lead to substantial disagreement between individual and representative (average) households about the value of product variety.

### Conclusion

The **truth about Mr Brown and Mrs Jones:**

- Possess different spending pattern
- Differences between spending pattern grow in income (for large incomes)  
⇒ **emergent consumption heterogeneity**
- Ignoring preference heterogeneity and focusing on representative households leads to underestimation of value of product variety  
⇒ It is worthwhile to pay attention to what Mr Brown and Mrs Jones do instead of only focusing on average behavior