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** \( E_i \):

\[
E_i = - \sum_{j=1}^{k} \phi(s_{ij}) = s_{ij} \ln s_{ij} \quad s_{ij} > 0
\]

\[
\phi(s_{ij}) = 0 \quad s_{ij} = 0
\]

\( \Rightarrow \) Entropy \( E_i \) increases when expenditure shares become more equal

**Group Level Spending Diversity** \( \hat{E}_g \):

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

**Empirical approach:**

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

1.1 The Engel Curves for Spending Diversity

![Engel Curves for Spending Diversity](image)

- **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 \( x_i \) (e.g., cross-country studies like Clements et al., 2006).

- **Stylized fact 2:** Positive or inverse-U relation between group level spending diversity \( \hat{E}_g \) 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:**

\[
U_i = \left[ \sum_{j=1}^{k} \frac{q_{ij}}{p_j} \gamma_j \right]^{\beta_j - 1} \]

**Set up:**

- Basic need good \( j = 1 \) with \( y_1 > 0 \); two more luxurious goods \( j = 2 \) and \( j = 3 \) with \( y_2 = y_3 < y_1 \)
- \( p_1 = 1, p_2 = p_3 = p \)
- Two (groups of) households \((i = 1 \text{ and } i = 2)\) with same expenditures \( x \)
- \( \beta_1 = 1 - \beta_2 \), equal preferences for good 1

**Implications:**

- Aggregated demand \( Q_j = q_{1j} + q_{2j} \) for each good \( j \) is independent of preference heterogeneity. I.e. of \( \beta_2 \) and \( \beta_3 \) (for \( \beta_1 \), \( x \), and \( p \) given)
- Aggregated demand can be derived from utility maximization problem of two (groups of) representative households with (per household) expenditures \( x_k = x \) and average preferences \( \hat{\beta}_2 = 1 - \hat{\beta} \) and \( \hat{\beta}_3 = \hat{\beta} = 3 \)

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

- **Engel Curves when \( y_3 > 0 \)**
- **Engel Curves when \( y_2 < 0 \)**

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 (\( y_2 = y_3 < 0 \)) can be simultaneously introduced through innovation or trade
- Value of product variety: amount \( P_r \) 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 \( \beta_j \) (\( j = 2, 3 \)) values variety more than a household with average preferences \( \bar{\beta}_j = \frac{\sum_{i} \beta_{ij}}{n} \) does and the more so, the more heterogeneous these preferences are (i.e. \( F_i > F \), holds, with \( \sum_{i} \beta_{ij} > 0 \) when \( \bar{\beta} > \frac{1}{2} \)).

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 patterns
- Differences between spending patterns lead to variance in consumption heterogeneity
- Ignoring preference heterogeneity and focusing on representative households leads to underestimation of value of product variety
- It is therefore worthwhile to pay attention to what Mr Brown and Mrs Jones do instead of only focusing on average behavior.