

Incorporating Demographics into the Model

Household characteristics are important in the way they affect demand patterns and thereby result in different rates of food cost increases for different households. Incorporating a vector of household characteristics in our model means that the Tornqvist indexes can differ across household types, depending on the extent that inflation affects the goods purchased. For illustrative purposes, assume that there is only one household characteristic that is a continuous variable. Hence, the cost function may be written as:

$$\ln c(u_h, p, z_h) = a(p) + b(p)u_h + d(p) \ln z_h, \quad (34)$$

where $a(p)$ and $b(p)$ have been defined in equations 24 and 25, and where

$$d(p) = \varepsilon + \sum_i \zeta_i \ln p_{it}. \quad (35)$$

The complete demand system can then be written as:

$$w_{iht} = a_i(p_t) + [b_i(p_t)/b(p_t)] [\ln x_{ith} - a(p_t) - d(p_t) \ln z_h] + \zeta_i \ln z_h. \quad (36)$$

Again, we can let the intercept shift for each time period, thereby capturing the substitution effects, and estimate the Engel curves in this way:

$$w_{iht} = A_{it} + B_{it}(\ln x_{ith} - \alpha_0 - \eta \ln z_h) + \zeta_i \ln z_h, \quad (37)$$

where η is the equivalent income scale (already estimated) at reference period prices. However, following the logic of Fry and Pashardes (1989), our strategy is to cross-tabulate the data by the z variables, say by household size, so that the η and $\ln z_h$ terms can be absorbed into the definition of the minimum household expenditure, α .

Note that with the data tabulated by z variables, dummy variables can also be entered in a traditional way to account for various types of noncontinuous demographic effects, such as race and region, for both the intercept and the slope parameters. The practical implication is that we can have more than one reference household, for instance, grouped by race, age, and/or region.

We cross-tabulated our data by race, region, and household size. For race and region, z_h was a dummy variable equaling zero or 1. For household size, we let z_h equal the log of the household equivalent scale implicit in the official poverty lines for households of one to seven members. By doing this, we derived the three indexes noted earlier (fixed weight, substitution, and marginal expenditure indexes) plus three marginal indexes for household size, race, and region.