Encyclopedia of World Poverty

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ENGEL COEFFICIENT

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Proportion of family income that is spent on food. It receives its name in honor to the German statistician Ernst Engel (Dresden, 1821 - Radebeul, 1896).

Engel coefficient and Engel's Law. In a famous study using budget data of 153 Belgian families, Engel found that the lower a family's income, the greater is the proportion of it spent on food. Later studies have confirmed this empirical regularity that has been called Engel's law. According to Houthakker (1957), "of all the empirical regularities observed in economic data, Engel's Law is probably the best established."

Engel's Law is a *ceteris paribus* relationship. That is, it holds when prices and preferences are kept constant. An alternative way to enunciate Engel's Law is by saying that the income elasticity of the demand of food is smaller than one. To see this, let $f(p,y)$ be the demand function for food that depends on the vector of prices p and real income y. The Engel coefficient is

$$EC(p,y) = \frac{f(p,y)}{y}$$

Engel's Law establishes that the partial derivative of the Engel coefficient with respect to income is negative. This derivative can be written as:

$$\frac{\partial EC(p,y)}{\partial y} = \frac{1}{y^2}\left(\varepsilon_{f,y} - 1\right)$$

where $\epsilon_{f,y}$ is the income elasticity for food consumption. Therefore, it is clear that Engel's Law holds if and only if the income elasticity of food is smaller than one.

Engel coefficient and estimation of the poverty line. The Engel coefficient plays an important role in several methods for the estimation of the poverty line. Since the seminal study by Rowntree (1901), the *cost of basic needs (CBN)* approach has been one the most commonly used methods to estimate poverty lines. According to this methodology, poverty is the lack of some basic consumption needs and the poverty line is the cost of these needs. To implement this method we should stipulate a basic consumption bundle and then calculate its cost using information on prices. The implementation of this method poses some practical problems. In particular, the choice of the basic needs bundle is quite arbitrary, especially for non-food products. However, objective nutritional requirements can provide a defensible anchor to define a bundle of basic food products. For instance, the food poverty line could be the cost of buying 2,000 calories per person per day. However, we are typically interested in a poverty line for total consumption or income and not just in a food poverty line. Let z be the total poverty line, and let z_f and z_{nf} be the food and the non-food components of the poverty line such that $z = z_f + z_{nf}$. Suppose that z_f has been estimated using the CBN approach described above, but z_{nf} is unknown. By definition of the Engel coefficient, we have that $z_{nf} = z(1 - EC(z))$, where $EC(z)$ is the Engel coefficient for a household with income equal to the poverty line. Therefore,

$$z = \frac{z_f}{EC(z)}$$

This formula shows that to estimate the poverty line we need to know the Engel coefficient of a household with income equal to the poverty line. An approach that has been used in many poverty studies (see Fisher 1992) is to estimate the poverty line as $z = z_f / EC_p$, where EC_p is the average Engel coefficient for the group of households with income below percentile *p*, where *p* is typically between 25% and 50%. As argued in Ravallion and Bidani (1994), this approach can provide biased estimates of the poverty line because the Engel coefficient EC_p is not necessarily an unbiased estimate of $EC(z)$. Ravallion and Bidani propose to use household level data to estimate an Engel curve for food consumption and use the estimated curve to calculate the poverty line. Suppose that we estimate a log-linear Engel curve, then Ravallion and Bidani's estimate of the poverty line is the unique value z that solves the equation:

$$z = \frac{z_f}{\alpha + \beta \log(z)}$$

where α and β are the intercept and the slope of the log-linear Engel curve, respectively.

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