TFP Estimates and Cross-country Comparison

Index number method

Aggregation of outputs and inputs are sensitive to the aggregation process and the choice of index formula. While both direct and indirect methods can be used to derive real output and input, an indirect approach is usually preferred, whereby real output and input quantities are measured as the gross value of outputs or inputs divided by a corresponding price index. This is because value data for most outputs and inputs are more readily available than quantity data. Using the indirect approach, the estimation of real output, real input and productivity is converted into the estimation of output and input relative prices.

For each country, we use a Törnqvist indices to approximate a linearly homogeneous translog function to calculate output and input price indexes, such that

$$\ln\left(\frac{P_t}{P_{t-1}}\right)=\frac{1}{2}*\sum_i(R_{it}+R_{i,t-1})\ln\left(\frac{P_{it}}{P_{i,t-1}}\right) \tag{2}$$

$$\ln\left(\frac{W_t}{W_{t-1}}\right)=\frac{1}{2}*\sum_j(S_{jt}+S_{j,t-1})\ln\left(\frac{W_{jt}}{W_{j,t-1}}\right) \tag{3}$$

where R_i is the revenue share of the ith output and S_j is the cost share of the jth input. and are the prices of output and input, respectively.

We use the Törnqvist index for two reasons. First, the Törnqvist (or translog) index provides a reasonable second-order approximation to an arbitrary, twice differentiable linear homogenous function. Second, Ball et al. (1997) also showed that the Törnqvist index retains a high degree of characteristicity when combined with the Caves-Christensen-Diewert (CCD) formula for transitivity (Drechsler 1973). This means that a price index estimated when using this method is not dependent on the basket of goods in one particular country that is used in the comparison.