How to decompose live births into elements, using the total fertility rates

(Definitions)

x: 15, 16 ••••• 49

Female population of age x: Nx Female population of ages 15 - 49: N = ΣNx

Number of children which given birth to by females of age x: Bx

Number of live births: B = ΣBx

Live birth rates at age x: $bx = \frac{Bx}{Nx}$ $Bx = Nxbx$

Proportion of female population of age x: $px = \frac{Nx}{N}$ $Nx = Npx$

Total Fertility Rates (TFR) = Σbx

Decomposition of live births based on the above definitions is as follows:

$B = \Sigma Bx = \Sigma Nxbx = \Sigma Npxbx = N\Sigma pxbx$

$= N\Sigma bx \frac{\Sigma pxbx}{\Sigma bx} = N \times TFR \times \frac{\Sigma pxbx}{\Sigma bx}$

$= N \times \frac{TFR}{35} \times \frac{\Sigma pxbx}{\Sigma \frac{1}{35} bx}$

Difference in age distribution: $\frac{\Sigma pxbx}{\Sigma \frac{1}{35} bx}$

Comparing the numerator with the denominator of difference in age distribution, the live birth rate (bx) is common to both, while the proportion of female population (px) and the proportion in age distribution used in the total fertility rate ($\frac{1}{35}$) differ.