ESTIMATING TEMPO EFFECT AND ADJUSTED TFR

Documentation to the European Demographic Datasheet 2010 (July 2010)

The conventionally reported indicator of the level of fertility in a given calendar year (the period Total Fertility Rate or TFR) reflects the interplay of two components: *tempo* (timing) and *quantum* (level) of fertility. The tempo component affects the TFR when the timing of childbearing over the life cycle changes. In Europe most countries are currently experiencing a postponement of births, which is also reflected in an increasing mean age of childbearing, especially at first birth. For instance, the mean age of first-time mothers in Sweden has risen from 24.2 years in 1974 to 28.8 years in 2008. The shift towards later childbearing results in a decline in the number of births during this period and therefore depresses the period TFR, even if the number of children that women have over their life course does not change. One can also think of this tempo effect in terms of an expansion of the interval between generations during which fewer births fall into each calendar year.

In order to come up with a measure of the level (quantum) of fertility in a given calendar year that is free from this tempo effect and is a better indicator for the average number of children per woman than the observed period TFR, the concept of "tempo-adjusted TFR" has been developed. A first adjustment method was proposed by Bongaarts and Feeney (1998) and, subsequently, several other methods have been suggested as well (e.g., Kohler and Ortega, 2002). The adjusted TFR as listed in this data sheet is calculated on the basis of the Bongaarts-Feeney (1998) formula which uses fertility data specified by age of mother and birth order of child. The adjusted TFR (*adjTFR*) in a year *t* for birth order *i* is computed as follows:

(1) $$adjTFR_i(t) = TFR_i(t) \, / \, (1 - r_i(t))$$

where $r_i(t)$ is the change in the mean age at childbearing of birth order *i* between the beginning and the end of year *t*, which is estimated as follows (see Bongaarts and Feeney (2000: 563, fn. 1)):

(2) $$r_i(t) = [MAC_i(t+1) - MAC_i(t-1)] \, / \, 2$$

where $MAC_i(t)$ is the mean age of the childbearing schedule of order *i*, calculated from age-specific fertility rates. The overall tempo-adjusted total fertility rate for all birth orders is computed as the sum of the adjusted order-specific total fertility rates.

To reduce instability in the estimated adjusted TFR, the datasheet gives the mean of the adjusted TFRs for the three-year period 2005-2007 whenever available. The adjustment was performed for birth orders 1, 2, and 3, whereas the conventional TFR was used for birth orders 4+. Since only a small fraction of the overall total fertility is due to births of birth order 4 and higher (about 5 percent of the overall TFR in a typical European country), this procedure did not entail any significant underestimation of the tempo effect. For countries for which no such data are available the adjusted TFR is estimated from the data on the overall TFR and MAC for all birth orders combined (see below).

Data used for Computing Adjusted TFR

Data on age-specific fertility by age of mother and 'true' (biological) birth order of child used for computing the adjusted TFR with the Bongaarts-Feeney formula were computed from the data on births by age of mother and birth order from Eurostat online database (accessed in March 2010) and Human Fertility Database (www.humanfertility.org). In case these data were not available or the time series were not sufficiently long, data were acquired from country-specific data sources[1]. When available, the data pertain to the period 2005-2007. For some countries, different periods were used due to limited availability of the most recent data[2]. For countries where detailed order-specific data on births were not available, the estimates of the tempo effect were derived from data on the conventional TFR and the mean age at childbearing (MAC)[3], using procedure described in the next section.

Estimating Tempo Effect in the absence of order-specific data on fertility rates

The application of the Bongaarts-Feeney (BF) formula requires the TFR and the mean age at childbearing (MAC) to be specified by birth order. These data are not available for some countries in Europe (see above), for which the TFR and the MAC are reported for total births only. The BF formula cannot be readily applied with these data because the MAC for all births is a weighted average of the order-specific MAC_i, where the weights are TFR_i/TFR (*i* denotes birth order). When fertility falls, the number of higher-order births, which occur at older reproductive ages, often declines faster than the number of lower-order births. Hence the shift in higher-order TFR_i can have a disproportionally high impact on the value of MAC. The order-specific fertility rates may change in such a way that the MAC decreases in time when its order-specific components (MAC_i) stay unchanged or even increase.

However, we can still make use of MAC to infer approximate values for the tempo effect, given that certain assumptions are valid. We assume that fertility quantum is relatively low, say below 2.0, and therefore the impact of the fall in higher-order fertility is low as well; that it does not change considerably during the period under consideration; that all MAC_i change in a uniform way; and that these changes are rather small, say an increase of not more than 0.2 per year. The assumptions are likely to hold in most countries with low fertility.

Considering these assumptions, Bongaarts-Feeney adjusted TFR can be estimated also for the countries where order-specific information on fertility rates is missing, simply applying it to all birth orders combined:

$$adjTFR(t) = TFR(t) / (1-r(t)),$$
$$r(t) = [MAC(t+1) - MAC(t-1)] / 2$$

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[1] Data from National Statistical Offices were used for Albania, Andorra, Denmark, Liechtenstein, Turkey, United Kingdom and Japan. Data for Belgium (Flanders only) come from van Bavel (2008). Data for Germany come from Kreyenfeld et al. (2010).

[2] The data pertain to other period than 2005-07 in following cases: Albania (2006), Armenia (2007), Azerbaijan (2007), Italy (2004-06), Moldova (2007), Montenegro (2006-07), Switzerland (2007), United States (2003-05), and Japan (2005-06).

[3] Data on total birth order were used for Albania, Andorra, Denmark, Italy, Liechtenstein, France, United Kingdom, and Turkey.

Acknowledgements

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