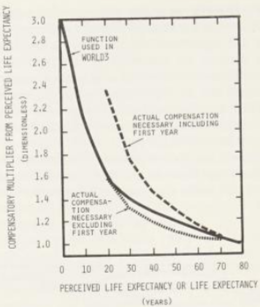

Figure 2-65 Different assumptions for the compensating multiplier from perceived life expectancy

tancy PLE is a delayed and perhaps biased function of the actual life expectancy at any time. A bias function would shift the dashed line up or down if there is evidence that parents consistently tend to overcompensate or undercompensate for the survival probabilities that they perceive.

In World3 we assumed that there are two components to parents' perceptions of survival probabilities—one short-term and accurate, one long-term and delayed. The accurate, short-term component reflects the fact that parents who actually experience an infant death can (within the bounds of the fecundity multiplier) have another child to replace the one that died. This component is immediate and accurate, since there is no need for the whole reproductive population to perceive and compensate for infant deaths. Parents who lose a child can adjust their own desired total fertility to attain their ultimate family-size goals. The effect of this short-term compensatory component is negligible in considerations of long-term population dynamics because infant deaths, at any prevailing mortality level, are balanced by new births (except in cases of severely impaired fecundity). Thus this short-term feedback loop is omitted in the world model; infants that die within the first year are assumed to be replaced with a short delay and with no effect on the average desired total fertility.

The second, long-term component of the compensatory multiplier from perceived life expectancy may be more important both to the rate of population growth and to the design of population policy. This component arises from the tendency of parents to compensate for the possible loss of a child, even after the child survives the

hazardous first years of life. In this case, the parents must extend their perception of mortality probability over a longer period, probably at least until their children are old enough to marry and have children of their own. Since there is no short-term feedback telling them whether their own children will be among the survivors, their perception must be a function of the common societal mortality experience; thus it must be delayed. The delay is explicitly included in World3 as the lifetime perception delay LPD.

Some preliminary data on the length of the lifetime perception delay LPD come from the studies of D. M. Heer (personal communication), who has conducted surveys asking residents of rural Kentucky, U.S.A., and Shenking township, Taiwan, to estimate the probability that a baby born today will live to age 15. The apparent perception delay was around 30 years in Kentucky and 3 years in Taiwan. (It may be that the difference in these delay times was caused by a difference in the relative rates of change of infant and total mortalities in the two areas. The rapid perception change in Taiwan may be a result of recent changes in infant mortality only, so that the short-term compensatory perception has been influenced, with no need to change the long-term one.)

The long-term compensatory multiplier in World3 is modeled as a function of perceived life expectancy PLE. The perceived life expectancy PLE is related to the actual life expectancy LE by a third-order delay (lifetime perception delay LPD) of 20 years. The actual form of the compensatory multiplier from perceived life expectancy CMPLE used in the model is shown as a solid line in Figure 2-65 and in Figure 2-66. The two dashed lines in Figure 2-65 show the approximate actual fertility compensation that would statistically be necessary if survival to age 15 is the goal and if first-year mortality is included (the upper line) or excluded (the lower line). To exclude the short-term compensatory component associated with infant mortality, we chose a function approximating the lower line. In the absence of any information about a bias in perceived life expectancy, we assumed that there is none, that the compensatory behavior of parents is based on delayed but not systematically biased information.

Although this compensatory multiplier from life expectancy is at present only a hypothesis, it is consistently cited as a basis for population policy (see Frederiksen 1969) on the assumption that active campaigns to reduce infant mortality will reduce fertility and, presumably, population growth rates. Of course, a program to reduce infant mortality can be justified for reasons other than reducing population growth rates. However, such a program as a measure for population control can succeed only if two conditions hold true. First, the delay between reduced death rate and the response through reduced birth rate must be quite short. Otherwise, the large gap created between the newly imposed lower death rate and the not-yet-adjusted birth rate will lead to a large increase in population growth rate, an increase that might persist for decades. Second, under high mortality conditions, parents must consistently overcompensate for the actual prevailing mortality probabilities, and under conditions of low mortality they must either undercompensate or compensate correctly. Otherwise, in addition to the short-term increase in the population growth